

DEVELOPING A COMMUNICATION CHECKLIST TO ENHANCE PATIENT
SATISFACTION WITH TOTAL KNEE REPLACEMENT SURGERY:
A MIXED METHODS STUDY

By

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ABSTRACT

Total knee replacement (TKR) surgery improves patients' quality of life by reducing pain and increasing function. However, up to 20% of patients are reportedly dissatisfied. The goal of this study was to develop a communication checklist to enhance the quality of surgeon-patient communication, which was hypothesized to increase TKR satisfaction via the management of patients' post-operative expectations. The mixed methods research design began with a qualitative study of eight participants who were interviewed about their recovery. The results of two qualitative analyses contributed to the development of the Orthopaedic Surgery Outcome Communication Checklist, which four surgeons used in a community hospital setting to guide discussions with their patients about progress, expectations, and outcomes in post-operative clinic visits up to 6 months. In the subsequent, quantitative study, 60 patients received the checklist intervention in their follow-up visits from 6 weeks up to 6 months post-operatively. Their self-reported satisfaction after 6 months was compared with 67 patients who received the usual standard of care communication and had been surveyed prior to the checklist development. The checklist patients reported significantly higher satisfaction on four of five measures of satisfaction: overall satisfaction and expectations met ($p = .02$); surgeons' communication ability ($p = .01$); care and concern shown by the surgeon ($p = .01$), and satisfaction with the amount of time surgeons spent in post-operative follow-up visits ($p < .001$). Satisfaction with relief from pain and return to function was not significant ($p = .06$). A random sample of the duration of post-operative follow-up visits was recorded. The mean difference between the two groups was 1 minute, 51 seconds, indicating significantly more time was spent in the checklist groups' follow-up visits ($p =$

.001). The communication checklist has practical significance because patient satisfaction is a metric that is increasingly being used as a key performance indicator for surgeons and health care institutions alike. Furthermore, the need for TKR surgery in Canada is expected to rise dramatically over the coming decades due to obesity and our aging population. Greater TKR satisfaction will benefit patients, surgeons, and the health care system overall.

DEDICATION

For Jac.

Your love, support, wisdom, and humour are beyond what I could have wished for and exactly what I needed. The example you continually set in your work inspires me more than you will ever know — work hard, care deeply, dream big, and don't be afraid to let your reach exceed your grasp. This would not have been possible without you.

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TABLE OF CONTENTS

ABSTRACT	ii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vii
List of Tables	ix
List of Symbols, Nomenclature, or Abbreviations.....	x
1.0 INTRODUCTION	1
1.1 Background	1
1.2 Statement of the Problem.....	6
1.3 Purpose of the Study.....	6
1.4 Research Questions.....	7
1.5 Research Design	8
1.6 Rationale and Justification for the Study.....	9
1.7 Research Ethics	10
2.0 LITERATURE REVIEW	14
2.1 Search Terms	14
2.2 Osteoarthritis	14
2.3 Total Knee Replacement Surgery	24
2.4 Patient Expectations and Satisfaction.....	30
2.5 Surgeon-Patient Communication	54
2.6 Checklists in Health Care	57
3.0 QUALITATIVE STUDY	62
3.1 Introduction	62
3.2 Philosophical Assumptions and Interpretive Framework	62
3.3 Theoretical Framework	65
3.4 Role of the Researcher	69
3.5 Research Questions.....	71
3.6 Methodology	71
3.7 Results.....	79
3.8 Creative Interpretation of the Giorgi Analyses	108
3.9 Discussion	110
3.10 Significance of the Qualitative Study	114
3.11 Limitations of the Qualitative Study	114
3.12 Conclusion	116
4.0 CHECKLIST DEVELOPMENT	117
4.1 Introduction	117
4.2 Checklist Development Process	118
4.3 Directed Content Analysis	118
4.4 Results.....	119
4.5 Expert Panel Review and Pilot Testing	123

5.0 QUANTITATIVE STUDY.....	124
5.1 Introduction	124
5.2 Research Questions.....	125
5.3 Methodology	125
5.4 Results.....	133
5.5 Discussion	141
5.6 Significance of the Quantitative Study	150
5.7 Limitations	151
5.8 Conclusion	155
6.0 SUMMARY OF MIXED METHODS STUDY	156
6.1 Summary of Findings	156
6.2 Practical Application	157
6.3 Significance of the Mixed Methods Study	157
6.4 Limitations of the Mixed Methods Study	158
6.5 Directions for Future Research	159
6.6 Conclusion	159
7.0 REFERENCES.....	161
Appendix I Diagram of Equal-Status Sequential Mixed Methods Study	175
Appendix II Informed Consent Form for Qualitative Research Study	176
Appendix III Qualitative Interview Protocol	181
Appendix IV Orthopaedic Surgeon Outcome Communication Checklist.....	182
Appendix V Informed Consent Form for Quantitative Research Study (SoC Group)	184
Appendix VI Informed Consent for Quantitative Research Study (Checklist Group)	186
Appendix VII Satisfaction Questionnaire.....	191
Appendix VIII Patient Information Sheet	194
Appendix IX Ongoing Informed Consent Form (Checklist Group)	195
CURRICULUM VITAE or CV	

List of Tables

TABLE 1. Participant Characteristics Giorgi Method	Page 79
TABLE 2. Participant Characteristics Directed Content Analysis	Page 120
TABLE 3. Example of Directed Content Analysis.....	Page 121
TABLE 4. Participant Characteristics Quantitative Study	Page 135
TABLE 5. Satisfaction Subscale Reliability Analyses	Page 136
TABLE 6. Summary of <i>t</i> -tests	Page 138
TABLE 7. Satisfaction Odds Ratios	Page 139
TABLE 8. Holm-Bonferroni Corrections	Page 139
TABLE 9. Exploratory Analysis of Age and Sex Differences in Satisfaction.....	Page 140

List of Symbols, Nomenclature, or Abbreviations

Biomedical model is an explanatory model of illness and health that conceptualizes illness and disease as a disruption of physiological processes that either cause, or are caused by, injury, biochemical imbalances, or infection (Borrell-Carrió, Suchman, & Epstein, 2004).

Biopsychosocial model is a model proposed by George Engel in 1977 to challenge the biomedical model. In this model, biological, plus psychological and social factors contribute to health and illness (Engel, 1977).

Confounders (confounds), “in treatment comparisons, any factors other than the treatments being compared which may affect the health outcomes being measured” (Centre for Evidence-Based Medicine, Nuffield Department of Primary Care Health Sciences, University of Oxford, 2018).

Expectations are defined as “beliefs that certain actions will achieve particular outcomes” (Haanstra et al., 2012, p. 2).

Osteoarthritis (OA) is a progressive, age-related disease of the joints in which the articular cartilage breaks down, and eventually degrades the underlying bone causing chronic pain and impaired functioning of the hands, feet, hips, knees, and spine (Bombardier, Hawker, & Mosher, 2011).

Participants/Patients are terms used interchangeably when referring to the men and women who consented to take part in this study. All were participants in the study and all were patients recovering from TKR. At times one role was more prominent than the other and the term used at any given time was intended to recognize that distinction.

Satisfaction is “The action of gratifying (an appetite or desire) to the full, or of contenting (a person) by the complete fulfillment of a desire or supply of a want; the fact of having been gratified to the full or of having one’s desire fulfilled” (OED Online, 2017) and “the degree of congruence between expectation and accomplishment” (Heidegger, Nuebling, Saal, & Kreienbühl, 2008, p. 1).

Total knee replacement (TKR) also known as total knee arthroplasty, a surgical procedure in which the patient is under general or regional anesthesia and the surfaces of the distal femur, proximal tibia, and sometimes the patella, are replaced with a knee joint prosthesis (Bellmans & Ries, 2005).

1.0 INTRODUCTION

1.1 Background

In Canada, over 61,000 total knee replacement (TKR) surgeries were performed in 2015-2016, an increase of 20.3% over 5 years (Canadian Institute for Health Information, 2017). While those aged 65 to 74 had the largest volume of TKRs during this period, the most recent data available shows the greatest five-year increase in age-specific rates were those in the 45 to 54, and 55 to 64 age groups (CIHI, 2014). For all ages, end-stage osteoarthritis (OA) is the most common responsible diagnosis for TKR surgery in Canada (CIHI, 2017). Systemic risk factors for OA include older age, female sex, and race, while local risk factors include obesity, previous knee injury, and occupations requiring repetitive strain on joints (Zhang & Jordan, 2010). Rates of TKR are expected to increase concomitantly with the growing prevalence of OA due to Canada's aging and increasingly obese population (Bombardier et al., 2011). By 2040, 10 million Canadians (one in four) will have osteoarthritis, with an estimated 500,000 suffering from moderate to severe disability (Bombardier et al., 2011), the primary indication of TKR.

Total knee replacement (TKR) surgery can significantly improve an osteoarthritic patient's quality of life by reducing pain and increasing mobility. However, it has been reported that up to 20% of TKR patients are dissatisfied with their outcomes (Baker, van der Meulen, Lewsey, & Gregg, 2007; Bourne, Chesworth, Davis, Mahomed, & Charron, 2010; Hamilton et al., 2013). In Canada, that means over 12,000 patients are dissatisfied with their TKRs. Dissatisfaction with TKR diminishes or negates the well-established benefits of the procedure. Successful TKR results in individual and societal benefits such as increased quality-adjusted life years for patients, increased employment and earnings

through fewer missed workdays, and lower disability claims (Ruiz et al., 2013). Moreover, successful TKRs and satisfied patients require fewer follow-ups and subsequent interventions, which reduces the burden on an already over-subscribed health care system (Losina et al., 2009).

TKR satisfaction is purported to be correlated with the fulfillment of patient expectations (Scott et al., 2012) with some suggesting it is predicted by meeting pre-operative expectations (Dunbar, Richardson, & Robertsson, 2013; Hamilton et al., 2013; Scott et al., 2012). However, a review of five studies published between 2006 and 2010 found that meeting pre-operative expectations did not correlate with post-operative satisfaction, rather satisfaction was more often predicted by how well post-operative expectations were met (Culliton, Bryant, Overend, MacDonald, & Chesworth, 2012). This study extends this line of inquiry, focusing on the relationship between the perioperative experience and patients' expectations and satisfaction.

An important dimension of TKR expectations and satisfaction is surgeon-patient communication. While the literature on surgeon-patient communication specific to orthopaedics is relatively recent (Levinson, Hudak, & Tricco, 2013), this growing body of literature indicates that quality communication contributes significantly to patient satisfaction (Levinson et al., 2013) and surgeons can play an important role in helping their patients set and manage expectations that are realistic and achievable (Morris, Jahangir, & Sethi, 2013). Quality surgeon-patient communication may nonetheless be difficult to achieve. Congruency between surgeons' and patients' opinions on the severity of the osteoarthritis, and benefits and risks of TKR has been studied, with modest to poor congruency found between patient and surgeon (Street, Richardson, Cox, & Suarez-

Almazor, 2009). As in other medical specialties and settings, some surgeons may not be particularly attuned to patient concerns and preferences, some may underestimate patients' fears, and some may miss subtle cues of patients' emotional concerns (Street et al., 2009). Discordance has been found between patients' and orthopaedic surgeons' reported satisfaction with the outcome of the TKR surgery, with surgeons reporting greater satisfaction than patients. Unmet patient expectations and surgical complications were most predictive of this discordance (Harris et al., 2013).

Communication issues may be exacerbated by the fee for service structure of the Medicare system in Canada, which favours, if not rewards, expediency in surgeon-patient interactions. A 2013 systematic review noted three studies of orthopaedic surgeon patient communication and reported the median duration of office visits was 10.5, 13.6, and 16.1 minutes respectively (Levinson et al., 2013). This was based on data from the United States, which may be different from Canada. In the same review, however, it was noted that much of the discourse initiated by surgeons focused on biomedical issues, and that collectively, the studies demonstrated a need for surgeons to attend to the emotional and psychosocial aspects of patient care (Levinson et al., 2013). Accordingly, the goal of the present study, namely to develop a communication tool to improve the quality of time-limited surgeon-patient interactions was intended to address these issues and make a novel contribution to the orthopaedic literature.

Sex/gender is also an important, yet not fully explained, mediating variable related to TKR expectations and satisfaction. Age-related differences in TKR outcomes are another growing area of study, in part due to the rapidly increasing cohort of patients under the age of 65 years undergoing TKR. Research on TKR outcomes for those aged 65 years

and older is well established, however recent studies looking at short-term outcomes with younger adults (i.e. those aged 50 years and younger) found higher rates of revision due to joint infection and mechanical failure (Meehan, Danielsen, Kim, Jamali, & White, 2014), whereas another study which assessed satisfaction, found that older adults had higher mean satisfaction scores than their younger counterparts, aged 55 years and younger (Williams et al., 2013). Questions are now being raised about the reliability of existing TKR patient-reported outcome measures in a younger patient population. Age-related differences managing OA have also been reported. A mixed methods study with a small sample of OA patients and a control group found that younger patients reported distress and frustration in managing the symptoms of OA (Gignac et al., 2006). Age and sex are therefore important variables when considering how patients set and manage expectations for TKR satisfaction.

Overall, studies of patient expectations in the orthopaedic literature reveal a construct that is multifaceted, complex, and not fully elucidated. Thus, much is still to be learned about how patients set and manage expectations, and whether fulfilled expectations ultimately influence satisfaction. To address these issues, this study used an equal-status sequential mixed methods design as described by Schoonenboom and Johnson (2017) with a qualitative study followed by a quantitative study. The qualitative study investigated the experiences of patients recovering from TKR surgery while they were recovering. Findings from the qualitative analyses were then used to develop the Orthopaedic Surgery Outcome Communication Checklist (the checklist), a communication tool that surgeons used to guide discussions with patients about their post-operative expectations and outcomes during the first six months after surgery.

In the quantitative study, the checklist was tested with a larger sample of TKR patients to determine whether its use significantly improved patient satisfaction with TKR measured 6 months after surgery. This mixed methods design was chosen because “problems most suitable for mixed methods are those in which the quantitative approach or the qualitative approach, by itself, is inadequate to develop multiple perspectives and a complete understanding about a research problem or question” (Creswell, Klassen, Plano Clark, & Clegg Smith, 2011, p. 6).

The use of a systematic mixed methods approach in this study was expected to contribute much needed knowledge of patient expectations and satisfaction with TKR. The checklist, as a communication tool, was created to help surgeons efficiently address patient expectations in clinical settings where expediency is prioritized. Checklists are increasingly being used in health care settings, such as surgical, intensive care, and trauma units, and have been shown to decrease medical errors and improve overall standards of patient care (Health Research & Educational Trust, 2013). The aim of this research was to determine whether the utility of the checklist model could be extended to surgeon-patient communication and ultimately impact satisfaction.

The checklist could have important practical significance for orthopaedic surgeons and their patients especially as the need for TKR both in New Brunswick and in Canada will grow rapidly over the coming decades. The potential contribution of this research is a communication tool that optimizes surgeon-patient interactions and increases patient satisfaction with TKR without sacrificing the efficiency needed for sustainable health care delivery.

1.2 Statement of the Problem

This study addressed three inter-related issues, (1) the prevalence of patient reported dissatisfaction with TKR outcomes, including the role of unmet expectations, (2) time constrained patient-surgeon communication, and (3) mixed findings of sex and age-related differences in TKR outcomes. After surgery, patients and surgeons have limited time together in follow-up clinic visits. Thus, the topics being discussed must be prioritized not only to ensure surgeons can quickly and accurately assess the clinical information available about the patient, but also that they can obtain progress information from the patient to identify issues or concerns, and if needed amend the care plan. This information exchange between patient and surgeon is believed to be an influential component of how post-operative expectations are set, which can ultimately contribute to satisfaction.

The main problem addressed in this research is that it is not fully understood how TKR patients establish and manage their expectations and the degree to which expectations contribute to satisfaction. Also not fully understood is the impact of sex and age on TKR expectations and satisfaction. This research filled a gap in the TKR literature and makes an original contribution to what is currently known about patient expectations and satisfaction by specifically addressing the role of enhanced surgeon-patient communication in patient satisfaction.

1.3 Purpose of the Study

The purpose of the study was to use a patient-oriented, qualitative research approach, namely a descriptive phenomenological method, to develop and test quantitatively, a communication checklist hypothesized to enhance the quality of surgeon-patient post-

operative interactions. The qualitative study involved interviewing TKR patients to get a broad overview of the lived experience of recovery as the patients were immediately experiencing it in order to explore expectations and satisfaction. The qualitative research contributed to the development of the checklist, which was used as a communication intervention and tested on a larger group of TKR patients using quantitative methods. The overarching goal of the study was to determine if the checklist resulted in statistically significant greater patient satisfaction after the 6 months post-operative period, and to assess the impact that the checklist had on the duration of follow-up clinic visits.

1.4 Research Questions

The qualitative study research question was, “*What are the essential features of the experience of recovering from TKR?*” The goal of the qualitative study was to discover from patients the information they need to help them set appropriate expectations for their TKR recovery. The quantitative study research question was two-fold, (1) “*Does the use of the communication checklist by the surgeon in post-TKR follow-ups from 6 weeks up to 6 months result in significantly greater patient satisfaction after 6 months?*” and (2) “*Does the use of the checklist add significantly more time to routine clinic visits?*”

The 6-week to 6-month time frame was the chosen study window because this is when most follow-up visits occur during normal post-TKR standard of care, although it should be noted that the timing and number of follow-up visits varies according to the surgeon’s clinical judgment. Follow-ups are determined on a case-by-case basis, as every patient and recovery is different.

1.5 Research Design

The research design was mixed methods with a qualitative study followed by a quantitative study. Mixed methods is described as a “a scientifically rigorous research project, driven by the inductive or deductive theoretical drive” (Morse & Niehaus, 2009, p. 14). Morse and Niehaus (2009) advocated designating a core and a supplementary component in mixed methods design. The core component is viewed as the foundation of the mixed methods study, which the authors suggested “must be conducted at a standard of rigor such that, if all else were to fail, it could be published alone (Morse & Niehaus, 2009, p. 23). However, this approach does not account for studies within the mixed methods paradigm that are conducted with equal standards of rigour such that both could be published alone. As Schoonenboom and Johnson (2017) explained, equal-status mixed methods research designs “result when both the qualitative and the quantitative components, approaches, and thinking are of equal value, they take control over the research process in alternation, they are in constant interaction, and the outcomes they produce are integrated during and at the end of the research process” (Schoonenboom & Johnson, 2017, p. 112). Based on these criteria, the present study is described as an equal-status sequential design since the qualitative study was followed by the quantitative.

Using Morse and Niehaus’ (2009) notation system indicating the core (uppercase) and the supplementary (lowercase), this study would be QUAL → QUAN. The use of uppercase denotes the equal weight of the studies, and the arrow denotes the sequential order of the studies. In this particular design, the QUAL and QUAN “strands occur across chronological phases, and the procedures/questions from the later strand emerge/depend/build on the previous strand; the research questions are interrelated and

sometimes evolve during the study” (Schoonenboom & Johnson, 2017, p. 118). In studies where the quantitative follows the qualitative, “the intent of the investigator may be to develop a survey instrument, an intervention, or a program informed by qualitative findings” (Creswell, Klassen, Plano Clark, & Clegg Smith, 2011, p. 6), which was the main objective of the present study.

Two methods comprised the qualitative study; the first was the descriptive phenomenological method in psychology, also known as the Giorgi (2009) method, and the second, a directed content analysis (DCA), which followed the procedure used in the first method. Specifically, the Giorgi (2009) method was used to investigate four participants’ experiences recovering from total knee replacement (TKR) surgery. An additional four participants were interviewed following the same interview protocol used in the Giorgi (2009) method. For the eight interviews, DCA was then used to identify potential items for the checklist (this is described in detail in Chapter 4). In the quantitative study, the checklist was used by a group of surgeons with their patients in their post-operative follow-up appointments up to 6 months and it was then tested to determine if it contributed to significantly greater patient satisfaction with TKR outcomes after 6 months compared to an earlier group of patients who received the standard of care communication from their surgeon and had been surveyed on their TKR satisfaction after 6 months. A graphical representation of the components and integration of the qualitative and quantitative studies is found in Appendix I.

1.6 Rationale and Justification for the Study

No study was found in the orthopaedic literature that attempted to develop and test a communication intervention that would directly contribute to patient satisfaction via

surgeon-patient communication. This was the main goal of this study, and it is also what defined the originality of the study among the existing research on TKR expectations and satisfaction. The contribution of this research was a communication checklist that was expected to optimize surgeon-patient interactions and increase patient satisfaction while maintaining the balance between the need for efficiency in clinic visits with the provision of effective patient-centered care.

Morse and Niehaus (2009) state that the research question or questions dictate the theoretical drive (either inductive or deductive) and must align with the methodology used. “Equal status research is most easily conducted when a research team is composed of qualitative, quantitative, and mixed researchers, interacts continually, and conducts a study to address one superordinate goal” (Schoonenboom & Johnson, 2017, p. 113). The superordinate goal of the current study was to determine if the communication checklist significantly improved patient-reported satisfaction without unduly increasing the duration of patient follow-up visits in a busy clinical practice.

1.7 Research Ethics

Ethics approval. Research ethics approval was obtained from all affiliated institutions of the student, the co-supervisors, and from the hospital where the study was undertaken. Re-approvals were obtained annually throughout the study period. All aspects of the study followed the guidelines in the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2, 2014).

Informed consent. Informed consent documents were developed from guidelines from the Research Ethics Board (REB) of the health authority that oversaw the hospital where the study was conducted. Potential participants were advised that they were not

obligated to participate in the study and that not taking part, taking part, or withdrawing their participation at any time during the study would not affect the care they would receive from their surgeon. The informed consent documents included all of the relevant clauses outlined in Articles 3.1 to 3.3 of the TCPS 2 (2014, pp. 26-32). In particular, participants were provided ample time to review the informed consent document and were encouraged to ask any questions about the nature of the study and their role as participants. The information in the informed consent documents was written in layperson's language. One signed copy was provided to each participant and one signed copy was kept in the research files. There were different informed consent forms for the qualitative and quantitative studies, and all are included as appendices.

Risks. The TCPS 2 (2014) describes the assessment of potential harm that might be experienced by participants taking part in, or conversely, being excluded from the research. It is incumbent upon researchers to assess, from the perspective of the participant, "the level of foreseeable risk posed to participants by their involvement in research... by considering the magnitude or seriousness of the harm and the probability that it will occur, whether to participants or to third parties" (TCPS 2, 2014, p. 209).

In this study, thinking about or discussing one's experience with the outcome of major surgery might be upsetting or might cause a participant to reflect on situations or emotions not thought about previously. While there was the potential for emotional discomfort for participants taking part in the qualitative interviews, it was believed that any discomfort would not be greater than what might be experienced by someone not taking part in the study who had undergone TKR and discussed their outcomes. Thus, the potential harm was considered to be transient, which is defined as a "temporary

emotional reaction to a survey question” (TCPS 2, 2014, p. 21).

Patient confidentiality. All interview transcripts from the qualitative study were assigned a code number and each participant was given an alphabetically ordered pseudonym. Participants were asked to answer ‘yes’ or ‘no’ on the informed consent document whether any direct quotes from their interviews could be used in any dissemination of the research. The researcher redacted any information in the transcript that might have led to the identification of a participant. A demographics questionnaire was used to collect relevant patient information (gender, age, other medical conditions, employment status, etc.). Each questionnaire was assigned a code number linking it to its corresponding transcribed interview and both were stored separately from the signed informed consent documents.

Participants were told verbally and advised in the informed consent document that if they divulged any information about the abuse of a child less than 19 years of age or the abuse of an older person, the researcher was obligated under the law to inform the Department of Health and Wellness for New Brunswick and would do so accordingly. Participants were also provided with the toll free number of the Privacy Officer for New Brunswick in the informed consent document in case questions or concerns arose about their privacy rights as research participants.

Feedback. Participants were asked if they were interested in obtaining a summary of the results of the study and were also invited to indicate if they wished to receive a copy of materials published in academic journals or abstracts from conference presentations, when and if these were to become available.

Data security. In the qualitative study, the researcher was not be able to collect anonymous data and therefore had to use “the last alternative” (TCPS 2, 2014, p. 59) which was to collect the study data and de-identify it immediately and store participant-identifiable documents apart from de-identified material. At the close out of the study, a copy of the transcribed interviews and all study information will be saved in a secure location for a minimum of 7 years or the length of time required by law. Signed consent forms were stored in a locked cabinet separate from the interview material and transcripts. Participants’ names and all identifying information were kept confidential and will never be revealed in any presentation or publication of the study results.

In the next chapter, the literature related to osteoarthritis and total knee replacement surgery from a sex and age perspective will be reviewed. Following that, patient expectations and satisfaction with TKR, surgeon-patient communication, and the development and use of checklists in health care will complete the literature review.

2.0 LITERATURE REVIEW

2.1 Search Terms

The following terms were used to search the literature using primarily PubMed and Medline: Osteoarthritis; Total Knee Arthroplasty; Total Knee Replacement; Patient Satisfaction; Patient Expectations; Sex and Gender Differences in Total Knee Arthroplasty/Total Knee Replacement; Age Differences in Total Knee Arthroplasty/Total Knee Replacement; Orthopaedic Surgeon/Physician-Patient Relations, Communication; Communication Checklists in Health Care; Patient Acceptance of Health Care. The first search of the literature occurred in 2013-2014 in preparation for the dissertation research proposal. The literature was updated on an ongoing basis during the intervening years and a second, more formal search was conducted in early 2017 as a final review of the literature. The grey literature was also searched and reference material was obtained from bodies such as the Canadian Institute for Health Information, the Government of New Brunswick surgical wait times web site, and EvidenceNetwork.ca.

2.2 Osteoarthritis

Osteoarthritis (OA) is the most common form of arthritis in Canada, and can affect the hands, feet, hips, knees, and spine (CIHI, 2013). As of 2010, over 13% or 4.4 million Canadians had OA, and it is the most common cause of disability (Bombardier et al., 2011). Approximately 49% of seniors over the age of 70 are estimated to be living with symptomatic osteoarthritis. By 2040, that number is expected to increase to 71% (Bombardier et al., 2011). In addition to older age, a number of other risk factors for knee osteoarthritis have been identified, including obesity, female sex, genetic factors, congenital or developmental defects, major joint trauma, and repetitive stress overloading

the joint (Arden & Nevitt, 2006; Felson, 2004; Jones & Doherty, 2005). In terms of health care costs and patient outcomes, it is important to note that some of the risk factors of OA are modifiable such as weight loss or reducing repetitive stress activities, while other factors such as older age, female sex, congenital joint malformation, prior knee injury, and a genetic predisposition for the disease are not. With a greater prevalence of OA in our aging, and increasingly obese population, OA is now considered a “public health problem” (Arden & Nevitt, 2006, p. 19), see also *Life with Arthritis in Canada: A Personal and Public Health Challenge* (Lagacé et al., 2010).

The main feature of OA of the knee is the breakdown of the hyaline articular cartilage at the distal femur and proximal tibia which causes “bone remodeling and attrition” (Felson, 2009, p. 1). Fibrocartilage degeneration of the meniscus may also cause changes in the loading function of the knee. OA can be categorized as the result of joint vulnerability in combination with joint use or abuse, where there is non-uniform loading in the joint (Felson, 2009; Felson, 2004; MacDonald Wood, Brock, Heil, Holmes, & Weusten, 2013). The main symptoms of osteoarthritis are pain, aching, and stiffness (MacDonald Wood et al., 2013). Radiographic evidence of OA in the form of joint space narrowing is not always correlated with patients’ reported pain and stiffness (Arden & Nevitt, 2006; Jones & Doherty, 2005).

Early management of OA is usually non-operative and may include non-steroidal anti-inflammatory medications (NSAIDs), analgesics, bracing, orthotics, a weight loss recommendation for overweight and obese patients, and mobility aids such as a cane or walker (Lagacé et al., 2010). Joint aspiration and intra-articular steroid injection may be used to improve synovitis, or inflammation of the synovial membrane in the joint (Jones

& Doherty, 2005). OA of the knee usually progresses slowly which allows for a number of non-operative treatments. However, responses to these treatments are varied and because of the progressive nature of the disease, many patients eventually require surgery. As a result, OA is the most responsible diagnosis for primary knee replacement performed in Canada in 2013-2014, with 97.9% of all cases reported by surgeons to the Canadian Joint Replacement Registry being attributed to OA (Canadian Institute for Health Information, 2017).

From an economic perspective, increasing rates of OA indicate that by 2040 almost 30% of the employed labour force will experience difficulty working due to the disease (Bombardier et al., 2011). A greater prevalence of OA in the working and volunteer segments of society will lead to increased sick leave, lost time, and rising health care costs, especially as many Canadians will continue working into what was traditionally viewed as retirement years, either through paid work or volunteerism. In 2010 Canadian dollars, indirect health costs or disability-associated wage-based productivity loss related to OA was estimated at \$17 billion and projected to be \$909 billion in 30 years (Bombardier et al., 2011). Furthermore, estimates indicated that the direct health care costs of OA in the form of medications, doctor visits, tests, and hospitalizations in Canada were \$10 billion in 2010 and are expected to increase to \$550 billion in the next three decades (Bombardier et al., 2011). These estimates did not take into account the direct and indirect costs of waiting for surgery as wait times in some jurisdictions continued to rise as the need for TKR increased due to aging and obesity.

The American Academy of Orthopaedic Surgeons' 2013 clinical practice guidelines for the non-arthroplasty treatment of knee OA stated that, "older adults with self-reported

osteoarthritis visit their physicians more frequently and experience greater functional limitations than others in the same age group. The aging of the baby boomers, rise in rates of obesity, and greater emphasis on staying active among the elderly population suggest that the emotional and physical impact of knee OA will continue to be widespread” (American Academy of Orthopaedic Surgeons, 2013, p. 8). Indeed, studies of patients’ experiences with OA offer both qualitative and quantitative evidence of the detrimental emotional and physical impact of the disease (Hawker, 2009).

In a large, community-based sample from urban and rural Ontario, 529 participants with symptomatic knee and hip OA were followed over a 2-year period to examine the relationship between OA pain and depressed mood (Hawker et al., 2011). After controlling for psychosocial and demographic variables in the predominantly female sample, results showed that increased disability and fatigue, possibly linked to sleep disturbances, was more predictive of worsening OA pain than depressed mood (both disability and fatigue, $p < .001$). The authors stated that similar to other studies of chronic pain, pain causes disability and fatigue, which leads to difficulty in performing the activities of daily living, as well as those activities that are considered valued life activities for the individual. Furthermore, the role of sleep in the pain-fatigue-depression cycle of OA suggest that sleep disturbances need to be identified and managed as part of the overall treatment plan for the disease.

A qualitative study of OA pain at night used focus groups of people with hip and knee pain in four countries. Participants were stratified by hip or knee OA, self-reported pain severity, gender, and age (40-54, 55-64, and ≥ 65). A constant comparative method of data analysis found three general themes related to night pain: (1) predictors of night

pain, (2) sleep disturbances, and (3) treatments and adaptations (Woolhead, Gooberman-Hill, Dieppe, & Hawker, 2010). Eighty-one percent of hip and knee participants experienced night pain. The predictors of night pain were over exertion in activities of daily living, and also recreational, and occupational activities. Weather, particularly dampness and cold was also a predictor of night pain. The second theme of sleep disturbances had four sub-themes: pain, movement and sleeping position, heightened awareness of night pain, and fatigue as a result of night pain. The third theme dealt with the participants' treatment and adaptations to night pain, such as orthopaedic beds, strategically placed pillows, and medications. The main finding from this sample of patients was that OA pain at night was somewhat variable, dependent on certain conditions, but was related to the progression of the disease. Some of the moderate to severe cases did not report pain at night, which suggested to the authors that pain at night might not be a reliable indicator of total joint replacement priority.

Another qualitative study, which used Giorgi's (1985) descriptive phenomenological method to investigate UK patients' experiences with OA while awaiting hip or knee replacement surgery, found similar themes. Here six themes were identified: (1) pain, its treatment and adaptations; (2) mobility issues; (3) coping with activities of daily living; (4) self-presentation; (5) help and support while awaiting surgery; and (6) the effects of the disease on others, such as family, friends, and helpers (Parsons, Godfrey, & Jester, 2009). The conclusions drawn from these themes were that patients in this sample felt there was a lack of information about what to expect while awaiting joint replacement surgery, and this lack of information combined with a further deterioration in function

caused patients a great deal of psychological distress due to a loss of independence and increased reliance on others.

In sum, a review of the available literature of the quantitative and qualitative research of patients' experiences with OA pain suggest that it is "multidimensional, reflecting the influence of biological (e.g. pain mechanisms), psychological (e.g. mood and coping), and social factors (e.g. social support)" (Hawker, 2009, p. 511) and that new and better measurements of OA pain are needed to assess the contextual or mediating factors such as mood, sleep, fatigue, coping, self-efficacy, and social support.

Sex and gender differences in osteoarthritis. The terms sex and gender are used in the OA literature, often interchangeably, so in the interest of clarity, "sex is determined by an individual's genetic composition and every cell has a sex. Gender is a more complex term and can encompass the influence of a culture on an individual and an individual's perception of their identity and behavioral roles within their society" (O'Connor, 2011). The Canadian Institutes of Health Research explains that, "There are no universally accepted definitions or easy separation of these terms. At the Institute of Gender and Health, we make a social/biological distinction between gender and sex with the caveat that they are interrelated and potentially inseparable" (CIHR, 2012, p. 116).

Over the next 25 years it is expected there will be a 1.44 times greater incidence of OA in women than in men in Canada (Bombardier et al., 2011). The factors that account for this discrepancy, which can be categorized as both sex-based and gender-based (O'Connor & Hooten, 2011), have not been fully explained (Hame & Alexander, 2013; Maleki-Fischbach & Jordan, 2010; O'Connor & Hooten, 2011).

Data on sex and age rates of OA in Canada is available from the Public Health Agency of Canada's 2010 report entitled *Life with Arthritis in Canada: A Personal and Public Health Challenge* (Lagacé et al., 2010). In 2007-2008, arthritis was the second most chronic condition reported by women, and the third most chronic condition by reported by men. Overall, nearly two-thirds (64%) of those affected with arthritis were women (Lagacé et al., 2010).

In the July 2013 report, *Arthritis in New Brunswick* by the Arthritis Community Research and Evaluation Unit (ACREU) of The Arthritis Society of Canada, arthritis was listed as the second most common chronic condition reported by adults in New Brunswick with 122,000 or 20% of population, age 15 years or older reporting arthritis (Arthritis Community Research & Evaluation Unit, 2013). Among women, it was the most common chronic condition, and among men, the third most common. In New Brunswick, 24% of women and 16% of men reported having arthritis, 56% were under 65 years of age, and a high proportion were overweight or obese which is not surprising because New Brunswick has one of the highest obesity rates in Canada (ACREU, 2013). The adult obesity rate in New Brunswick is higher than the national average, according to the 2015 Canadian Community Health Survey, even after taking into account differences in population age structure. Therefore, New Brunswick residents are at a heightened risk for TKR because the province ranks among the highest of all the provinces in Canada for aging, obesity, and arthritis.

One of the hallmarks of knee OA is the breakdown of articular cartilage, and it has been found in some research that women experience greater cartilage loss than men (Cicuttini, Jones, Forbes, & Wluka, 2004). Some suggest estrogen receptors in female

knee cartilage are directly affected by declining levels of estrogen due to menopause (Hame & Alexander, 2013) but others argue the evidence is not so clear (Arden & Nevitt, 2006; Zhang & Jordan, 2010). Arden and Nevitt (2006) cited a number of studies of estrogen use in postmenopausal women, which found a lower prevalence of OA in the estrogen users. The authors explained that, “evidence for a protective effect of oestrogen use is more consistent for OA defined by radiographic changes alone than for symptomatic or clinical OA” (Arden & Nevitt, 2006, p. 12) which is in line with many findings that radiographic evidence of OA is not always symptomatic (Jones & Doherty, 2005).

In a review of the literature on sex differences in OA using magnetic resonance imaging (MRI) and joint metabolism biomarkers, Maleki-Fischbach and Jordan (2010) looked at studies of patients’ knees unaffected by OA, and studies of the knees of children and young adults to understand sex differences in knee structure and components to shed light on what happens in OA knees. The authors found evidence of sex differences in cartilage volume with males having a greater volume than females, and also that sex differences in knee cartilage is evident in younger knees and extends through to the development of OA (Maleki-Fischbach & Jordan, 2010).

Two MRI studies reported by Maleki-Fischbach and Jordan (2010) were reviewed more extensively for this literature review, the first found that women had more pronounced cartilage loss over time (Cicuttini et al., 2004) and the second, a study of participants with no history of knee pain or clinical knee pathology, found that women had greater tibial cartilage loss over 2 years compared to men (Hanna et al., 2009). In Cicuttini et al. (2004), 113 symptomatic OA patients were followed for 4 years starting

with a baseline MRI and a second MRI 2 years later. Rates of cartilage loss were used to predict knee replacement at 4 years from baseline. Regression analyses revealed that for every 1% increase in the rate of tibial cartilage loss over 2 years, there was a 20% increased risk of undergoing a TKR at 4 years (Cicuttini et al., 2004).

Sex differences were also found in asymptomatic participants in Hanna et al. (2009). In this study 271 participants had MRIs at baseline and 27 months later. At baseline, men had greater cartilage volume than women, and women had a greater prevalence of patellar cartilage defects. In multivariate analyses, adjusting for potential confounders such as age, height and weight, the average annual percentage loss of tibial and patella cartilage was significantly greater in women and there was also a greater risk for the progression of tibiofemoral cartilage defects for the women in the sample compared to the men (Hanna et al., 2009). Both studies speculated on the role of estrogen in cartilage volume and health, due to decreased estrogen in post-menopausal women.

In their review of the literature, Hame and Alexander (2013) discussed sex differences in estrogen, anatomical and genetic differences, and past trauma, as potential contributors to the greater prevalence of OA in women. The authors note that, “it has been well established that women have increased incidence of anterior cruciate ligament (ACL) injuries and that these injuries lead to future osteoarthritis regardless of gender” (Hame & Alexander, 2013, p. 183).

Sex differences are also found in patient-reported experiences with OA. For example, a quantitative study of 208 participants found that women reported greater pre-operative osteoarthritis pain compared to men using a validated pain measurement scale (Tonelli et al., 2011). Differences have also been found in qualitative research into patients’

experiences of OA pain. Focus groups and a novel method of data analysis called comparative keyword analysis were used to investigate differences in the OA experience by hip or knee joint and by sex (Gooberman-Hill, French, Dieppe, & Hawker, 2009). The authors noted important sex differences in how women and men in the sample of 88 older persons discussed pain, with women using an expressive communication style vs. men who used a more instrumental style. Because most orthopaedic surgeons are men, these differences in communication style were suggested to possibly contribute to “inequitable provision of treatment for OA” (Gooberman-Hill et al., 2009, p. 359).

Osteoarthritis and age. It is expected that Canadians with osteoarthritis (OA) will increase to 20% by 2031 (Lagacé et al., 2010) and 30% by 2040 (Bombardier et al., 2011). Nearly three in five people with arthritis are under the age of 65 and Bombardier et al. (2011) estimated that if these trends continue, in the next 25 years, there will be a new diagnosis of osteoarthritis every 60 seconds, resulting in over 10 million working age people having this chronic disease. Projections showed that over 500,000 Canadians will suffer with moderate to severe disability due to OA (Bombardier et al., 2011). In New Brunswick, 56% of those with arthritis were under 65 years of age (ACREU, 2013). Similar to the rest of Canada, the ACREU (2013) reported that people with arthritis in New Brunswick used hospital services more than those without chronic conditions, “16% of people with arthritis, 11% of people with other chronic conditions, and 5% of people without chronic conditions, reported that they were hospitalized in the previous year. Generally, as people with arthritis get older, hospital use increases” (ACREU, 2013, p. 14).

2.3 Total Knee Replacement Surgery

When all other non-surgical treatments are exhausted, patients with OA may be recommended operative procedures such as arthroscopy, osteotomy, hemiarthroplasty, and arthroplasty, also known as total knee replacement surgery (Bellmans & Ries, 2005; Jones & Doherty, 2005). Arthroscopic debridement can be recommended when patients have mild OA with mechanical symptoms and fluid around the knee. An osteotomy can restore the mechanical axis of the lower limb and off-load the diseased compartment, and is generally reserved for younger, more active patients due to concerns with the durability of TKR implants within that age group (Bellmans & Ries, 2005).

Unicompartmental knee replacement (hemiarthroplasty) is an option for younger patients with unicompartmental disease or for much older, non-obese patients with unicompartmental osteoarthritis of the knee (Bellmans & Ries, 2005). Total knee replacement surgery is recommended when patients have symptomatic advanced degenerative changes in one or more compartments of the knee joint and for whom pain and disability has not been alleviated by all other non-surgical measures (Bellmans & Ries, 2005).

A total knee replacement (TKR) is a surgical procedure in which the patient's damaged knee joint is replaced with a femoral implant component and a tibial base plate. These implant components are made of a metal alloy, usually cobalt-chromium or titanium. The tibial component also has a polyethylene-bearing surface that is fixed to the metal base plate and allows for the smooth articulation of the metal components. Simply put, a TKR is "a substitution procedure in which cartilage, bone and ligaments are replaced with metal and plastic" (Dunbar et al., 2013, p. 151). The goals of TKR are to

reduce pain and allow the patient to resume normal activities of daily living. A successful TKR re-establishes mechanical alignment, balances the ligaments, and restores a normal Q angle (Bellmans & Ries, 2005). The quadriceps angle or Q angle is the intersection of two lines. The first runs from the anterior superior iliac spine (the bony protrusion of the pelvis) to the middle of the patella and the second line runs from the tibial tuberosity up through the patella. For females a normal Q angle is approximately 17 degrees (+/- 3°) and 14 degrees (+/- 3°) for males (Wheless, 2012).

Many studies of TKR outcomes note that it is one of the most effective interventions in health care because it relieves pain, and restores function (Hawker et al., 2013; Wylde, Dieppe, Hewlett, & Learmonth, 2007). As expected, TKR also leads to improvements in health related quality of life (Ethgen, Bruyère, Richy, Dardennes, & Reginster, 2004). In a systematic review of the literature from 1980 to 2003, Ethgen et al. (2004) found that 48 of the 74 studies that met the inclusion criteria, 16 focused on knee arthroplasty exclusively and 32 on knee and hip arthroplasty separately. Overall, TKR was effective in increasing health-related quality of life (HRQoL) when assessed between three and 24-months post-operatively. Notably, a number of studies found that patients with lower pre-operative function reported greater HRQoL post-operatively, but did not reach the same level of function as those who reported higher pre-operative function. It was also noted that most TKR outcome studies in the analysis were observational and lacked the strength of randomized controlled trials (Ethgen et al., 2004).

Determining the exact cost of a total knee replacement is challenging as it varies by jurisdiction. The Organization for Economic Cooperation and Development (OECD) reported that in 2010, the estimated cost of a knee replacement, on average across 24

OECD countries was about \$7,600 US (OECD, 2013). New Brunswick-specific TKR costs were not accessible, but a 2017 media report about the Nova Scotia government's announcement that it would spend \$6.4 million dollars to address its wait times backlog for joint replacement surgery provided some comparable estimates. It was announced that 500 more total joint replacements would be completed within the fiscal year, which puts the estimated cost of a total joint replacement procedure in Nova Scotia at \$12,800 (CBC News Nova Scotia, 2017).

In Canada, there were 61,421 TKRs in 2014-2015, which represents a five-year increase of 20.3% (CIHI, 2017). This number is based on data reported to the Canadian Joint Replacement Registry (CJRR), which in some provinces is mandatory and some voluntary. As a result, the CJRR reports coverage of 71.1% so the actual number of knee replacements in Canada is greater than the CJRR reports. The 61,421 TKRs that were reported included primary and revision surgeries with the ratio of primary to revision TKR at 13:1. Data for New Brunswick shows 1,465 knee replacements in 2015-2016, a 24.7% increase over 5 years and the ratio of primary to revision TKRs was 17:1. The median length of hospital stay in Canada for TKR was 3 days, which had declined by 1 day during the past 5 years (CIHI, 2017) and in New Brunswick it was 4 days in 2014-2015.

Sex differences in TKR. Sex differences in TKR utilization have been reported in Canada, the ratio of TKRs for women to men ratio is 1.43:1. Despite the greater prevalence of osteoarthritis and TKR in women than men, data in Canada indicate that women are recommended less for surgery (Borkhoff, Hawker, & Wright, 2011). In the wider TKR literature, sex differences have been observed in pre-and post-operative pain,

women higher (Gandhi et al., 2009; Singh, Gabriel, & Lewallen, 2008; Tonelli, Rakel, Cooper, Angstrom, & Sluka, 2011), deciding on surgery, women lower (Kamath, Horneff, Gaffney, Israelite, & Nelson, 2010), TKR utilization, men higher (Novicoff & Saleh, 2011), functional outcomes, women lower (Singh et al., 2008), cartilage loss, women higher (Cicuttini et al., 2004), and rates of improvement and speed of recovery, women higher (Liebs, Herzberg, Roth-Kroeger, R  ther, & Hassenpflug, 2011).

Many findings of sex differences rely mostly on self-reported data, yet interestingly, a review of 17,994 TKR cases in the United States found that male patients had higher rates of mortality, hospital readmissions, wound infections, and revision surgery (Singh, Kwok, Richardson, Chen, & Ibrahim, 2013). Men may experience worse outcomes based on objective, population level data, whereas women may report worse outcomes based on subjective, self-report data. It depends on how outcomes are defined. Overall, these important differences in how men and women experience TKR suggest that perioperative discussions relating to expectations may need to take sex and gender into account.

TKR and age. Utilization of total knee replacement (TKR) reported by the Canadian Institutes of Health Information (2015) showed that in 2013-2014, the average age for males was 67.4 years and 67.2 years for females. Among those who had a TKR in 2013-2014, 36.6% of men and 37.2% of women were between 65 and 74 years of age. While those aged 65 to 74 were the largest volume of TKRs, the greatest five-year increase in age-specific rates were those in the age groups of 45 to 54, and 55 to 64 (CIHI, 2014). Among women, there was a 15.8% increase for ages 45 to 54, and a 16.0% increase for ages 55 to 64. Among men, the increase was 13.8% for ages 45 to 54 and 14.5% for the 55 to 64 age group (CIHI, 2014).

As TKR rates continue to increase in adults under the age of 65 years, research on age differences becomes more important. From a large population-based study of 120,538 patients in the US who were stratified into three age groups ranging from under age 50 to 65 years and older, outcomes were assessed one year post-operatively. Patients < 50 years showed a significantly higher risk of undergoing revision due to periprosthetic joint infection or to aseptic mechanical failure, although the risk of infection was mitigated by higher volume hospitals, that is, those performing an average of \pm 200 TKRs annually (Meehan et al., 2014). The finding that patients younger than age 50 were “almost five times as likely to undergo revision due to aseptic mechanical failure within one year compared with patients sixty-five years of age or older” (Meehan et al., 2014, p. 534) could not be explained by the data according to the authors. They reported other studies of outcomes beyond one year had found that mechanical failure was due to greater activity levels in younger patients, resulting in wear and tear on the implant, and stress on the underlying bone and soft-tissue (Meehan et al., 2014).

Williams et al. (2013) noted that while studies such as Meehan et al. (2014) which looked at age differences in TKR via survival analyses (e.g., revision and mortality rates), these “do not accurately reflect the true clinical outcome” (Williams et al., 2013, p. 42) nor do they take into account outcomes from the patient’s perspective. To address this, Williams et al. (2013) used the Oxford Knee Score (OKS), a validated measure of knee pain and function, and the EQ-5D, a generic measure of health and disability, which are mandatory measures for the reporting of TKR outcomes to the National Health Service in England. The authors stratified 2,456 patients across five age groups from < 55 years up to \geq 85 years and compared the groups on pain and function (OKS), health related quality

of life (EQ-5D), and satisfaction. Outcomes were measured at 6 months for all patients in the sample, and 2 years for 41% of the sample. Results were that OKS and EQ-5D scores were comparable across all age groups, but there was a trend for greater improvement in younger patients (age < 55) as evidenced by the OKS scores. Interestingly, the younger group were more likely to be dissatisfied with surgery (Williams et al., 2013). The authors expressed some caution about the utility of the OKS and the EQ-5D in younger patients who are more active and as a result, the true clinical picture may not be captured by either of these outcome measures.

Keeney et al. (2011) carried out a systematic review of studies of TKR patients < 55 and found 13 studies which used the Knee Society clinical and function scores in 908 TKRs and 671 patients. In the younger age group, scores obtained using the Knee Society clinical and function measures were comparable with the scores from the older age group. It is important to mention that the Knee Society score is a surgeon-reported measure and does not capture the patient perspective. The authors of this review noted that the low volume of younger patients undergoing TKR meant that “multicenter collaboration and improving the details of data submitted to registries will be important to provide more reliable information to guide surgical decisions” (Keeney, Eunice, Pashos, Wright, & Clohisy, 2011, p. 582).

In Canada, the largest increase for knee replacement surgery was among those age 45 to 54 years (CIHI 2015). More research with this cohort will bring new understanding about the experience of TKR in younger patients, and will allow for comparisons with the breadth of research that exists with older cohorts. Like sex differences, age differences in

TKR may also influence and inform surgeon's perioperative discussions to take the expectations and outcomes of different age groups into account.

2.4 Patient Expectations and Satisfaction

Expectations. What are patient expectations for total knee replacement (TKR) and why should they matter? In order to answer this question, an understanding of the history of the research on patient expectations is helpful. Kravitz (1996) provided a broad overview of patient expectations in health care research. He noted that one of the earliest published articles on patient expectations was in 1968. Kravitz defined patient expectations as “beliefs or attitudes that interact with perceived occurrences to produce care-related evaluations” (Kravitz, 1996, p. 23). According to Kravitz the literature from 1968 to 1996 showed a lack of consensus around definitions, measurement, and as a result, he observed that there was no theoretical or conceptual models linking patient expectations “to cultural and social antecedents and to their cognitive, affective, and behavioral consequences” (Kravitz, 1996, p. 4). The literature, in Kravitz's estimation, framed expectations as either *probability expectations* which are patients' perceptions about the likelihood of certain health outcomes or events, or *value expectations* which are the hopes, wishes, desires for medical outcomes, “expressed as wants, perceived needs, importance (either absolute or relative), standards or entitlements” (Kravitz, 1996, p. 12). The concept of probability expectations has a more cognitive or fact-based objective orientation, while the concept of value expectations has a more affective, subjective orientation. These distinctions may be why patient expectations have been such a challenge for researchers and health care providers to define, measure, and manage.

Around the same time Kravitz (1996) called for a conceptual model of patient expectations, Thompson and Suñol (1995) identified four classes of patient expectations which they derived from the social sciences and business/marketing literature: *ideal* (desired or preferred outcomes); *predicted* (expected outcomes), *normative* (outcomes that usually occur), and *unformed* (subconscious or not fully articulated outcomes). They described each of these types of expectations as being formed by personal and social influences. Examples of personal influences include needs, values, experience, information, and moods and emotions, while social norms, group pressures, and sociodemography are examples of social influences (Thompson & Suñol, 1995).

These influences create expectations, which in turn are shaped by the health care experience. Thompson and Suñol (1995) explained that expectations are dynamic and emergent, and subject to the temporality of the situation. For example, the experience of a medical condition such as chronic pain is different in a number of fundamental ways than the experience of the birth of a child. The authors suggested that patients may begin with expectations that are ideal or unformed due to limited knowledge or experience, but this changes over time due to the combination of personal and social influences noted above. The challenge is how to measure expectations, and to understand the role of expectations in patient satisfaction. Thompson and Suñol (1995) suggested, “research needs to continue to be developed to look at the relationship between expectations and satisfaction in a variety of health care contexts, with different types of patients and different needs” (Thompson & Suñol, 1995, p. 140). Like Kravitz (1996), these authors called for a conceptual model of patient expectations to be developed to help clarify the definition of expectations in health care and its measurement, to better understand patient satisfaction.

A decade after Thompson and Suñol's 1995 publication, a team of Canadian primary care, geriatric, and community health researchers presented a conceptual model for the development of health expectations (Janzen et al., 2006). These authors described expectations as contributing "to an individual's psychological and physiological health ... and to the work of health professionals providing care, where the management of patient and caregiver expectations of care, and of its outcome, are major, day-to-day requirements" (Janzen et al., 2006, p. 38). While the relationship between expectations and satisfaction was acknowledged, the authors stated that the main purpose of their pragmatic model was to explain the process of how expectations are developed, and how that process influences health attitudes and in turn, health behaviours. Patient satisfaction (or dissatisfaction) from this purview is an outcome of this integrated system of expectation development.

To explain their model, Janzen et al. (2006) used the experience of a recently diagnosed, early-stage Alzheimer patient, named Mary. To understand the applicability of the model for TKR patients, the components of the model will be explained by changing Mary's Alzheimer diagnosis to osteoarthritis (OA). The components of the model include six phases that occur sequentially starting with a *precipitating phenomenon*; *prior understanding*; *cognitive processing*; *expectancy formulation*; *outcome*; and *post-outcome cognitive processing*, where satisfaction is determined.

The *precipitating phenomenon* for Mary was pain and stiffness in her knee that had been increasing in severity over a number of months. More recently her knee would suddenly give out which caused her to become fearful of falling and injuring herself. Janzen et al. (2006) described the precipitating phenomenon as a trigger that sets in

motion the subsequent processes. Mary's knee pain and stiffness, and her knee randomly giving out made her begin to worry that something was wrong with her knee.

The next component in the model is *prior understanding*, which comprised previous experience, knowledge and beliefs. In discussing her condition with her husband, Mary compared the current state of her knee with how it performed in the past in activities such as walking, gardening, and riding her bike. She realized that she had attributed some of the pain to simply getting older and acknowledged that she had reduced some of the activities that she enjoyed because of her knee. This is how knowledge and belief interact with previous experience. Knowledge and beliefs “constitute a set of assumptions about the physical, social, cultural, psychological, and emotional ‘rules’, whose actions realize what we consider to be ‘normal’ in day-to-day living” (Janzen et al., 2006, p. 41). For Mary, prior understanding of her experience with a fully functioning knee, her knowledge of people in her social group who have had knee replacement surgery, and her belief that people can experience joint pain as they age, made her realize her knee pain had begun affecting her quality of life and she should have her knee checked by her doctor. She saw her family doctor, who suspected OA, ordered x-rays, and referred her to an orthopaedic surgeon. The surgeon assessed Mary, and showed her the evidence of end-stage knee OA, and discussed the potential of a TKR. Mary realized she had time to think about it because the wait time for a knee replacement with this surgeon was 9 months. She asked to be put on the wait list for surgery.

Cognitive processing is the core component of the model. The first part of cognitive processing is characterized by an individual's sense of the likelihood that something might happen, the reason why it might happen, and the timing and duration of the event.

Janzen et al. (2006) called these different dimensions subjective probability, sense of causality, and sense of temporality, describing them as “interrelated, possibly simultaneous, and mutually influential” (Janzen et al., 2006, p. 41). Within the context of expectations development, subjective probability is the degree to which an individual thinks that an event will occur, such that, the greater the sense of probability, the higher the expectation of the event occurring.

Sense of causality has two components, internal and external causality. Internal causality is when outcomes are viewed as the result of an individual’s decisions and actions, and the skill or ability the individual possesses to take actions or decide. External causality is when outcomes are the result of chance or beyond a person’s control. For Mary, she perceived the need to have her knee replaced was the result of OA in her family (external causality) and her occupation that required substantial kneeling and squatting over the years may have contributed to additional wear and tear on her knee (internal causality). Janzen et al. (2006) suggested that expectations that are attributed to external causality might be more fixed and intractable than those attributed to internal causality because the outcomes are a result of chance. For Mary, the degree of influence on expectations for TKR may have been determined by which causality was more compelling.

The sense of temporality strongly influences expectations because human beings “use information about the past to predict future occurrences. Our sense of temporality is dynamic and subjective, dependent on the individual and his or her circumstances” (Janzen et al., 2006, p. 42). OA results in a decline in function and quality of life over time and surgery can restore function and quality of life. For Mary, there would be the

experience of greater pain and disability. Her symptoms would be managed through medication, the use of a cane, and possibly she would try to lose weight as recommended to help relieve the load on her joints, but ultimately she decided to have her knee replaced.

The next phase within the component of cognitive processing is comprised of self-efficacy and perceived expected subjective utility. Self-efficacy is “a subjective assessment of an individual’s ability to perform necessary behaviours in order to achieve future states” (Janzen et al., 2006, p. 42). Self-efficacy in the model is described as a type of expectation nested within a larger expectation. It not only relates to the degree to which an individual believes she or he can achieve a desired outcome, but self-efficacy also influences the amount of effort individuals put into achieving particular goals by affecting their determination to achieve those goals. Janzen et al. (2006) proposed that outcome expectations and self-efficacy “enjoy a reciprocal relationship, because self-efficacy is affected by outcome expectations, and vice versa” (Janzen et al., 2006, p. 42). For example, if Mary believed she was able to do the exercises prescribed by the physiotherapists as she recovered from her knee replacement, her expected outcome would include the effects of having done the exercises as recommended.

Perceived expected subjective utility is the positive or negative outcome that the individual believes will result from a given action. For Mary, having her knee replaced was viewed as a positive outcome that relieved her pain and increased her quality of life. If the perceived expectation was positive, the expectations for a positive outcome will be greater than if the perceived expectation was negative.

The last part of the cognitive processing phase of expectation development is goal setting. Goals are inherently subjective, taking into account one's own evaluation of one's ability to perform certain behaviours. Goals are formed on the basis of perceived self-efficacy and contribute to the last step in developing expectations. Like expectation itself, goals can be realistic or unrealistic and are dependent upon the individual's level of self-awareness, and the objective evaluation of the available facts.

Expectancy formulation is the next step in the creation of health expectations which are "estimates of behaviours and their consequences, and influence behaviour depending on the perceived consequence" (Janzen et al., 2006, p. 43). For Mary, she understood things might get worse before they got better because she had a number of months of waiting for her knee replacement and during that time, pain and dysfunction would likely increase. Tapping into her self-efficacy and the perceived expected subjective utility of the knee replacement, Mary found ways of coping while she awaited surgery by trying to lose weight, strengthening her quadriceps muscles, and talking to others who had knee replacements to increase her knowledge about the experience.

Once the expectation has been formed, the *outcome stage* is where the expectation shapes one's behaviour, attitude and motivation (Janzen et al., 2006). Behaviour can be thoughtful and purposeful (but not always) according to Janzen et al. (2006) and is related to whether the outcome expectation is positive, negative, or neutral. If the outcome expectation is positive, behaviours that yield positive results will be directed towards achieving positive outcomes, which in turn contributes to the creation of future expectations based on those behaviours.

In the model, behaviour, attitude, and motivation have a reciprocal relationship, with each influencing and being influenced by the other. Attitudes are formed from “the most important understandings a person holds about an object or situation” (Janzen et al., 2006, p. 44). These understandings not only form attitudes but direct behaviour, in that certain behaviours may be chosen over others because of one’s attitudes. Motivation is described as an internal process that activates and guides behaviour. Higher motivation increases behaviour in the direction of the expected outcome, and expectations also influence a person’s motivation. If an individual has high expectations for an outcome, they will be more likely to have a positive attitude about the outcome, and be more motivated to choose behaviours that will reinforce the desired outcome. Returning to the example of Mary, she had a positive attitude about her surgery and believed the surgeon and other health care providers were competent. This motivated her to adhere to the surgeon’s recommendations after surgery and to engage with the physiotherapist who helped her mobilize quickly, thus she behaved in ways that enhanced her recovery.

At the end of the model is *post-outcome cognitive processing*, which is comprised of the ‘realized perceived subjective utility’ or satisfaction/dissatisfaction with the outcome (Janzen et al., 2006). Satisfaction is subjectively evaluated and determined by “the distinction between what actually occurred, and what the individual thinks should have. If the difference between the two is negative, dissatisfaction will result, but if the difference is positive, the result will be positive” (Janzen et al., 2006, p. 44). The degree of difference determines the level of satisfaction/dissatisfaction and this evaluation of subjective utility is then stored as experience for recall during similar situations that might engage the expectation development process all over again.

Janzen et al. (2006) claimed that their pragmatic conceptual model of health expectation development not only applied to how an individual develops expectations about themselves and their own health status or quality of life, but it also applied to how family members, caregivers, and health care providers develop expectations about the individual's health outcome, and their direct and indirect role in that process for the individual and for their own expectations of outcomes. Although the model is not supported by empirical study, the ease with which one could apply the concept to another health experience (from Alzheimer's disease to OA-TKR) suggests that it may be applicable across all health domains. It may also explain why the literature on health expectations is so variable in terms of definition, measurement, and findings, because studies rarely discuss the theoretical foundation of expectation development.

As one might expect, the literature on TKR expectations in particular is as heterogeneous as the literature on health expectations is in general. Recalling that Thompson and Suñol (1995), Kravitz (1996), and Janzen et al. (2006) all recognized the need for theoretical, conceptual, and measurement clarity in research on patient expectations, it is surprising, and somewhat disappointing that no real progress has been made. In a systematic review of 18 papers on the influence of patient expectations on hip and knee replacement outcomes, Haanstra et al. (2012) observed that due to the lack of a theoretical framework of patient expectations, the "field is plagued by poor measurement" (Haanstra et al., 2012, p. 13). This impacts results, making interpretations and comparisons difficult. The authors also rated the methodological quality of the studies by independently scoring them using a 19-item scale adapted from a previously published quality assessment scale for observational studies. The methodological quality

for the 18 studies reviewed ranged between 6% and 79% (Haanstra et al., 2012). Despite methodological issues, the authors reported that there was limited evidence for an association between patients' expectations and outcomes in hip and knee replacement surgery. The authors also noted that the time at which expectations were measured varied and "it is arguable that the later expectations are measured, the more realistic they are and therefore will be stronger associated with outcomes. As far as we know no study has yet investigated which time point is best to measure expectations" (Haanstra et al., 2012, p. 13). The timing issue was also discussed by Kravitz (1996), who suggested that, "previsit expectations are uncontaminated by subsequent clinical events (such as physician-patient negotiation), they may be less relevant than expectations that persist during and after the visit" (Kravitz, 1996, p. 22).

Similarly, a review of five studies confirmed the hypothesis that no significant relationship existed between preoperative expectations and patient satisfaction after primary TKR (Culliton et al., 2012). The authors suggested that patients' experiences of surgery, recovery, and rehabilitation were the "ultimate informants of realistic expectations" (Culliton et al., 2012). To help explain this, the authors proposed that the consistent association found between post-operative expectations and satisfaction was due to a response shift in patients' subjective evaluations.

Response shift is described as a change in the meaning of one's self evaluation of a target construct that can occur due to one of three factors, (1) recalibration: change in the respondent's internal standards of measurement, (2) reprioritization: change in how a target is valued by the respondent, or (3) reconceptualization: change in how a target is conceptualized by the respondent (McPhail & Haines, 2010). Response shift has

implications for expectation and satisfaction studies because “there is increasing evidence that many patient-perceived outcomes are not stable over time but alter in response to adaptation to illness or symptoms, coping strategies, and changes in expectations resulting from experience (of treatment, other illness, and social or demographic factors such as age)” (Carr, 2002, p. 503). Response shift may be an explanation for the ‘disability paradox’ or ‘regression to the mean’ wherein patients are found to adapt to their level of disease and report a stable quality of life over time. Response shift has been discussed in the health literature for over three decades particularly in quality of life and outcomes assessment but has only been investigated in orthopaedics within the past decade (Razmjou, Schwartz, Yee, & Finkelstein, 2009).

An editorial by Woolhead, Donovan, and Dieppe (2003) lent support to the concept of response shift without specifically naming it. What is important to note from their editorial is that research on expectations showed differences in findings between quantitative and qualitative studies, which the authors argued was due to the limited fixed choice nature of the quantitative measures of expectations, and also that assessing expectations after the intervention was more methodologically sound because “it was only at the post-operation interview that the informants were able to describe their expectations (what they really thought would happen) in the light of what actually occurred in the hospital and operation process” (Woolhead, Donovan, & Dieppe, 2003, p. 1656). Therefore, it is important to keep in mind these three things when reviewing the TKR expectation literature: (1) methodology may be an issue, (2) response shift might be at play, and (3) the variability of the type and timing of the expectation measurement might make study comparisons difficult.

The methods and interpretations by Mahomed et al. (2002) in their prospective study of 102 hip and knee replacement patients prompted the editorial by Woolhead et al. (2003). The definition of patient expectations used in this study was the “anticipation that given events are likely to occur during, or as a result of medical care” (Mahomed et al., 2002, p. 1273). Expectations were rated based on four questions related to pain, limitations of usual activities, whether the surgery was expected to be a complete success, and likelihood of complications. The Western Ontario McMaster Universities Osteoarthritis Index (WOMAC) was used to evaluate functional ability of the hip and knee at baseline before surgery and then 6 months after surgery. Expectations in this Canadian sample were not associated with age, gender, or type of surgery (hip or knee). In all 75% of patients expected to be completely pain free, and this was predictive of greater improvement in pain and function as assessed by the WOMAC.

While Mahomed et al. (2002) found no sex or age differences in TKR expectations; other studies have observed age, sex, and even race differences. In a study of 1,799 Canadian hip and knee patients, Gandhi, Davey, and Mohamed (2009) found that older female patients had lower expectations. There was also a trend toward significance for those with higher BMI to have lower expectations regardless of sex or age. All measures were taken pre-operatively and at one year post-operatively. In this study, expectations were assessed by three questions related to the time to fully recover from surgery, pain expected after surgery, and the ability to perform usual activities (Gandhi et al., 2009).

Another large sample of patients was assessed at baseline, at 3 months, and 12 months post-operatively. Age and sex differences were found in this Spanish cohort (Gonzalez Sáenz de Tejada et al., 2010). Older age and female sex was associated with

lower expectations as assessed by five questions: pain relief, ability to perform daily activities, walking ability, ability to interact with others, and improved psychological well being. Also notable was that patients whose pre-op expectations were fulfilled had greater gains in health-related quality of life which the authors had assessed using pre- and post-operative WOMAC difference scores, the mental and physical Short-Form 12, and the EQ-5D, a generic measure of health and disability.

One of the few studies that looked at changes in expectation scores pre- and post-operatively found that changes in expectations were not related to satisfaction but instead it was post-operative pain and function, and problems with the other joint that was predictive of satisfaction at 2 years (Mannion, Kämpfen, Munzinger, & Kramers-de Quervain, 2009). In this study of 112 Swiss patients, expectations were assessed with three questions, expected time until full recovery, expected pain from surgery, and expected limitations in everyday activities after surgery. Similar findings that satisfaction was related to post-operative pain and function have also been reported (Lingard, Sledge, & Learmonth, 2006). In this study, the sample comprised patients from the US, the UK and Australia. Assessment of expectations was carried out with four questions on pain level, walking distance, ability to take part in recreational activity, and use of a walking aid. Within the four dimensions of expectations assessed, younger age, male sex, fewer comorbidities, lower BMI, and better physical function were associated with a greater expectation of walking ability at 12 months post-operatively.

The studies mentioned above used various questions to assess expectations, many related to function, with limited consideration given to expectations of psychological well being as a result of surgery. In this review, only one expectation measure considered the

functional, psychological, and social expectations of the TKR patient. The validated Hospital for Special Surgery Knee Replacement Expectations scale (HSS-KRES) is a measure of a patient's expectations of TKR developed from responses from 161 patients and an expert panel. A further 62 patients were involved in the test-retest reliability assessment (Mancuso et al., 2001). The scale can be used pre- and post-operatively for the assessment of fulfilled expectations, a crucial patient-centered measure of outcome satisfaction, and can also be used for patient education, shared decision-making, and to help set reasonable goals for surgical outcomes (Mancuso et al., 2001). The HSS-KRES comprised 19-items and used a 5-point Likert scale ranging from 'complete improvement or back to normal' (scored as 1), 'a lot of improvement' (2 points), 'a moderate amount of improvement' (3 points), 'a little improvement' (4 points) or 'this expectations does not apply to me/I do not have this expectation' (5 points). A sample question was, "How much relief or improvement do you expect in the following areas as a result of your knee replacement... to improve ability to interact with others (for example, take care of someone, play with children)". Responses were summed and potential raw scores ranged from 19 to 95. Raw scores were then transformed $[(\text{raw score}/95) \times 100]$ to a score that ranged from 20 to 100, with lower scores indicating higher expectations. The survey has shown good test-retest reliability and content validity (Mancuso et al., 2001).

Studies obtained for this literature review which used the HSS-KRES include Muniesa et al. (2010) who studied 479 Spanish patients and reported that older age, higher pre-operative pain, and depression were correlated with lower expectations. In their conclusion, the authors suggested that "an understanding of the expectations, how they are formed, what individual psychological aspects take part and how to modulate

them, is the way which, in conjunction with surgical advances, will lead to achieving better results expressed in terms of satisfaction in the process” (Muniesa et al., 2010, p. 86).

Another large sample of TKR patients in the US ($n = 1,943$) completed the Hospital for Special Surgery (HSS) expectation survey (Hepinstall, Rutledge, Bornstein, Mazumdar, & Westrich, 2011). Univariate analyses found younger age, male gender, white patients, and patients who lived with a partner or spouse had significantly higher expectations for their TKR. Multivariate regression analysis showed that age, living with a partner or spouse, previous joint replacement, and higher scores on the SF-36 (general health measure) and a quality-of-life measure were significant predictors of higher expectations with 9% of the observed variation in expectations scores explained by the model. The authors surmised that the remaining 91% of variability in patients’ expectations may be accounted for by things not easily measured or predicted, such as the patients’ frame-of-reference for the surgery; prior experiences with medical interventions in general, and associations with family members who had joint replacements in particular; and the patient’s general level of trust in the health care system and/or the surgeon (Hepinstall et al., 2011). The other notable comment was that these authors characterized high expectations as potentially unrealistic, which “are common and not confined to young or active patients, highlighting the need for discussion of realistic expectations with all patients” (Hepinstall et al., 2011, p. 875).

A review of the qualitative literature of TKR patient expectations is summed up with a qualitative meta-synthesis which was undertaken to summarize the evidence on decision-making regarding TKR surgery, framed as expectations and experiences of TKR

in older adults (O'Neill, Jinks, & Ong, 2007). Ten qualitative studies were included in the synthesis and the analysis revealed that social and cultural categories of aging influenced expectations of knee OA, which in turn shaped patients' expectations of treatment options and outcomes. Most importantly, the role of the surgeon or the general practitioner was the strongest theme to emerge across all ten studies, which interestingly was not part of any expectations measures used in any of the other studies mentioned. "The doctor-patient relationship is an important concept in relation to decision-making regarding TKR surgery" (O'Neill et al., 2007, p. 6) and this also has implications when viewed within the context of expectations and satisfaction, which will be discussed later in the review of the TKR satisfaction literature.

Mancuso et al. (2008) used a randomized controlled trial of an expectation intervention in the form of an information module about expectations for recovery during the 12 months after hip or knee replacement surgery. The goal of the study was to determine if patients' expectations could be modified with a pre-operative intervention that would impact their expectations for their 12-month post-operative recovery period. Nurse instructors gave the randomly assigned control group of patients a standard pre-operative education session, while the randomly assigned case group received the standard pre-operative education session plus the information module on post-operative expectations. The primary outcome was the within-patient change in the total expectations survey score (i.e., the follow-up score minus the baseline score). The results were that for TKR patients, the intervention group had greater change in pre-operative expectation scores compared with the controls, while the hip patients had no significant change between cases and controls. It is important to note that both groups, whether hip

or knee had high expectations. Notably for the study of knee expectations, it was reported that baseline expectations, worse pain and function, and older age was associated with a greater change in expectations (Mancuso et al., 2008).

To sum up the literature on patient expectations in TKR, it is a multifaceted and complex construct with many mediating variables. Published research showed inconsistencies in definitions, terminology, measurement, and issues with methodological quality (e.g., some research designs combined hips and knees). Some studies reported an association between expectations and satisfaction while others did not. Associations between post-operative expectations and satisfaction have been found, whereas a number of studies have found limited correlation between pre-operative expectations and satisfaction. No study investigated which time point is best to measure expectations, and as a result the literature reviewed showed the time of expectations measurement ranged from 6 weeks to 1 day prior to surgery, and various time points after surgery. There was speculation in some studies that more information about surgery and greater interaction with surgeons could positively impact expectations but no published work on this was found. Age, sex, and race differences in expectations have been observed but this is not borne out across all of the studies reviewed. Few studies looked at the interaction of psychological factors (e.g. self-efficacy, pain catastrophizing, depression) and some have and found relationships between expectations, satisfaction, and mental health.

Of all of the studies reviewed and cited here only one study had reported on an expectation intervention which was Mancuso et al. (2008) mentioned above. This study is particularly relevant for the current research study because it highlighted that while there are numerous studies of expectations, very few have attempted to study whether

expectations can be modified. Moreover, no study reviewed, including Mancuso et al. (2008), attempted to use an expectation intervention to modify patient satisfaction.

Satisfaction. The literature on patient satisfaction with TKR was more straightforward than the literature on TKR expectations. A great deal of congruency existed between satisfied and dissatisfied patients across a number of studies. One of the largest studies in the literature review reported the outcomes from the Swedish Knee Arthroplasty Registry. Over 27,000 surveys had been sent to patients who had TKRs over the previous 2 to 17 years (Robertsson, Dunbar, Pehrsson, Knutson, & Lidgren, 2000). The response rate was 95% and overall 81% reported satisfaction with outcomes in response to one question with a 4-point rating of satisfaction. Satisfaction was associated with the chronicity of the most responsible diagnosis for TKR, i.e. among those with long-term conditions such as rheumatoid arthritis (RA), 86% were satisfied compared with those who had a shorter term illness such as osteonecrosis where only 70% reported satisfaction (Robertsson et al., 2000). There was no correlation between age and satisfaction or sex and satisfaction overall, but analysis within disease categories found statistically significant differences. Women with OA were slightly, but significantly less satisfied than men (82% versus 84%), and younger age was significantly associated with satisfaction in the RA group. There was significantly less satisfaction with outcomes for patients who had revision surgery (59% satisfied) compared to primary TKR (83% satisfied), and those who had revisions due to infection were less satisfied (47%) than those who had revisions for other reasons (61%). Among the revision group, those who had a complete implant exchange, 67% were satisfied and those who had a partial

replacement, only 52% were satisfied, a statistically significant difference (Robertsson et al., 2000).

An extension of Robertsson et al. (2000) was undertaken to evaluate whether the three item-satisfaction questionnaire used in the registry study correlated with well-known, reliable and validated TKR and health related questionnaires (Robertsson & Dunbar, 2001). A random selection of 3,600 patients who had received the satisfaction questionnaire 9 months earlier received one of five previously validated general health and disease/site-specific outcome measurements. The response rate was 84% and those who responded were significantly more satisfied than those who did not respond (as compared with satisfaction scores from Robertsson et al., 2000, the earlier study). There was a significant correlation between satisfaction and the general health and disease-specific scores, with the highest associations in measures of pain followed by improvement in physical function (Robertsson & Dunbar, 2001). Taken together, these studies with large sample sizes showed that patients reported high levels of TKR satisfaction as early as 2 years and as long as 17 years post-operatively with no overall differences in satisfaction due to age or sex.

Baker et al. (2007) also reported on a large sample of patients from England and Wales. In this study, 10,000 patients from the National Joint Registry who had a primary TKR within the previous 2 years were sent the Oxford Knee Score (OKS) and one satisfaction question, 'Are you satisfied with your knee replacement'? Response choices were 'Yes', 'No' and 'Not sure'. The response rate was 87%, and 82% of respondents reported being satisfied, 7% not satisfied, and 11% not sure (Baker et al., 2007). Aside from the patient-reported OKS and satisfaction, all other data was collected from the joint

registry. Multivariate regression modeling showed that patients with higher pain and function scores on the Oxford Knee Score had significantly lower satisfaction.

Satisfaction ratings and data from the joint registry were also analyzed. Females, patients with a primary diagnosis of OA, age (< 65 years), type of prosthesis (unicondylar vs. cemented implant), and the American Society of Anesthesiologists (ASA) score (3 vs. 1) were less satisfied with their outcomes (Baker et al., 2007). The authors noted that some of these findings should be viewed with caution, such as the ASA score being predictive of satisfaction since the ASA score is the grade the anesthesiologist rates patients prior to surgery to identify those with greater comorbidities for whom surgery might pose a greater risk.

Hamilton et al. (2013) also analyzed National Joint Registry data of 4,709 hip and knee replacement patients who were at a minimum 12 months post-surgery. The patients were sent the Oxford Knee or Hip Score, the SF-12, a measure of mental and physical functioning and overall health-related-quality of life, and a measurement of overall satisfaction, with questions proposed to be related to satisfaction such as how well the surgery allowed the patient to perform regular activities, and the degree to which the surgery met the patient's expectations. The response rate was 95%, and 87% of respondents were satisfied. Five variables were predictive of overall satisfaction: meeting pre-operative expectations, satisfaction with pain relief, satisfaction with the overall hospital experience, and better pre-operative Oxford hip or knee scores. Unlike Baker et al. (2007) and similar to Robertsson et al. (2000), age and sex were not predictive of satisfaction.

A Canadian study using data from the Ontario Joint Replacement Registry combined with patient-reported outcomes, and clinical data had an 83% return rate for 1,703 primary TKR patients who were surveyed one year post-operatively (Bourne et al., 2010). Similar to other studies, 81% of patients were satisfied with their outcomes, with satisfaction with pain relief ranging from 72–86% and satisfaction with function ranging from 70–84%. Univariate analyses found that older age, living alone, < 90° of flexion, pain at rest, and a complication requiring a revision were significantly associated with dissatisfaction. Odds ratios for the variables significantly related to patient dissatisfaction were expectations not met (10.79 greater risk of dissatisfaction), lower WOMAC score (2.59 greater risk), preoperative pain at rest (2.49 greater risk), and a postoperative complication requiring hospital readmission (1.99 greater risk) (Bourne et al., 2010).

The five studies discussed so far illustrate that joint replacement registries provide useful data that can be combined with specific measurements to enhance the knowledge of patient-reported outcomes from TKR. While there were consistent rates of satisfaction across many of the studies reviewed, there was more variability in the predictors of patient satisfaction. A number of studies showed pain and function issues as predictors of dissatisfaction as identified by the Oxford Knee Score (Clement, MacDonald, & Burnett, 2013; Judge et al., 2011; Scott, Howie, MacDonald, & Biant, 2010) and the WOMAC (Bourne et al., 2010; Bullens, van Loon, de Waal Malefijt, Laan, & Veth, 2001; Kim, Chang, Kang, Kim, & Seong, 2009; Kwon et al., 2010).

Two studies that used the much longer 55-item Total Knee Function Questionnaire also found the absence of functional impairment was significantly correlated with satisfaction (Devers et al., 2011; Noble, Conditt, Cook, & Mathis, 2006). Also predictive

of satisfaction was fulfilled expectations (Bourne et al., 2010; Noble et al., 2006; Vissers et al., 2010), absence of depression (Merle-Vincent et al., 2011; Scott et al., 2010), BMI < 27 (Merle-Vincent et al., 2011), absence of pain in another joint (Scott et al., 2010), and no comorbidities (Merle-Vincent et al., 2011). Not predictive of satisfaction was knee flexion greater than 130° (Devers et al., 2011) or socioeconomic status (Keurentjes et al., 2013).

In most studies, satisfaction measures were short; ranging from one to three questions (Baker et al., 2007; Bourne et al., 2010; Bullens et al., 2001; Clement et al., 2013; Judge et al., 2011; Keurentjes et al., 2013; Kwon et al., 2010; Merle-Vincent et al., 2011; Noble et al., 2006; Robertsson et al., 2000; Scott et al., 2010; Vissers et al., 2010). The studies with longer measures of satisfaction included Hamilton et al. (2013) with seven questions, including a question relating to the hospital experience, while Devers et al. (2011) had 13 questions as part of the Total Knee Function Questionnaire.

Mahomed, Gandhi, Daltroy, and Katz (2011) observed the lack of a validated satisfaction questionnaire for joint replacement surgery and sought to address this gap with the Self-Administered Satisfaction Scale for Primary Hip and Knee Replacement (SAPS). A review of the joint replacement literature and an expert panel of rheumatologists, an orthopaedic surgeon, and a behaviour scientist determined the scope of the scale items, which focused “on the various facets of patient functioning most affected by TJR” (Mahomed et al., 2011, p. 2). A total of four items were selected: satisfaction with surgery, pain relief, ability to perform house or yard work, and ability to do recreational activities. A 4-point Likert scale was used with 25-point increments from very satisfied equaling 100 points to very dissatisfied equaling 25 points. The final score

was the un-weighted mean of the scores from the individual items, ranging from 25 to 100 per item. An independent panel of orthopaedic surgeons and rheumatologists assessed the face validity of the scale. The measure was found to have excellent internal consistency reliability. Convergent validity was also established from responses from 843 total hip replacement patients and 857 TKR patients at 12 weeks and at 1 year post-operatively.

To conclude the review of the literature on expectations and satisfaction, the issue of age and sex/gender differences warrants additional comment because of its relevance to the current study. As noted above, age differences in satisfaction was reported by Baker et al. (2007), Bourne et al. (2010), in a subset of the analyses by Robertsson et al. (2000), and in two other studies reviewed but not discussed in detail (Merle-Vincent et al., 2011; Noble et al., 2006). Conversely, age differences in satisfaction were not evident in Hamilton et al., (2013), Judge et al., (2011), Scott et al., (2010), Vissers et al., (2010), and in the larger group analysis of Robertsson et al. (2000). Sex differences showed similar variability, no differences were found in eight of the studies reviewed where sex was a proposed variable related to satisfaction (Hamilton et al., 2013; Judge et al., 2011; Merle-Vincent et al., 2011; Noble et al., 2006; Robertsson et al., 2000; Scott et al., 2010; Vissers et al., 2010) but was found to be significant in three studies (Baker et al., 2007; Bourne et al., 2010; Robertsson et al., 2000). In Robertsson et al., (2000) only in the subset analysis of OA patients was female sex associated with dissatisfaction.

Age differences in expectations were found in ten of the studies reviewed. In seven studies, older age was inversely correlated with lower expectations (Gandhi et al., 2009; Gonzalez Sáenz de Tejada et al., 2010; Hepinstall et al., 2011; Lingard et al., 2006;

Mancuso et al., 2008; Muniesa et al., 2010; Razmjou et al., 2009) and in three studies no differences were found (Cross et al., 2009; Lavernia et al., 2012; Mahomed et al., 2002). Similarly, sex differences in expectations were reported in a number of studies where men had higher expectations than women (Gandhi et al., 2009; Gonzalez Sáenz de Tejada et al., 2010; Hepinstall et al., 2011; Lingard et al., 2006; Mancuso et al., 2008; Muniesa et al., 2010; Razmjou et al., 2009). Six studies found no sex differences in expectations (Cross et al., 2009; Gandhi et al., 2009; Groeneveld et al., 2008; Lavernia et al., 2012; Mancuso et al., 2008; Muniesa et al., 2010).

A possible explanation for these disparate findings of age and sex in expectations and satisfaction may be found in a study that compared outcomes of hip and knee replacement patients (Hamilton et al., 2012). Over 1,400 total hip and 1,200 total knee replacement patients were surveyed at a pre-operative assessment, and at 6 and 12 months post-operatively using the Oxford Hip and Knee Scores, the general health Short Form-12, and a satisfaction question rated on a four point Likert scale from dissatisfied to very satisfied. The results were that satisfaction was greater in the hip patients compared with the knee patients (91% satisfied vs. 81%) and “the difference is physical in nature and is evident within 6 months postoperation” (Hamilton et al., 2012, p. 631).

In developing the Self-Administered Satisfaction Scale (SAPS), Mahomed et al. (2011) also found differences in satisfaction between hip and knee patients with hip patients reporting greater satisfaction than knee patients. The authors commented on this difference suggesting that “hip arthroplasty consistently demonstrates superior functional outcomes as compared to the knee, potentially because the ball and socket design of a hip joint is easier to replicate with metallic implants as compared to a more complicated

hinge joint such as the knee” (Mahomed et al., 2011, p. 5). Whether there are fundamental differences between hip and knee replacement expectations and satisfaction that can be attributed to differences in patients is speculative and beyond the scope of this review. Since a number of studies combined hip and knee patients in both the expectation and satisfaction literature, the results from these studies should be viewed with caution, especially because it has been consistently reported that total hip replacement patients report higher satisfaction than TKR patients (Lau, Gandhi, Mahomed, & Mahomed, 2012).

2.5 Surgeon-Patient Communication

The American Association of Orthopaedic Surgeons (AAOS) identified surgeon-patient communication as a key driver of patient satisfaction (Morris et al., 2013), yet orthopaedic surgeons receive limited communication training required for patient-centered care (Tongue, Epps, & Forese, 2005). As specialists, orthopaedic surgeons often do not have the benefit of time that primary care physicians have in developing long-term relationships with their patients. Orthopaedic surgeons are also challenged by time constraints within these often short-term relationships due to the fee for service structure of the health care system in Canada, which is further exacerbated by lengthy wait times for elective surgery such as knee or hip replacements.

The evidenced-based national benchmark for knee replacements is nine out of 10 surgeries completed within 182 days. At The Moncton Hospital during the study period between 2014 and 2017, nine out of 10 TKRs were completed within a median of 631 days (range 500 to 768 days) according to the province’s surgical wait times web site (New Brunswick surgical wait times, 2017). Therefore, for many patients at The

Moncton Hospital the wait is 247% longer than the national benchmark. As a result, after the decision to have surgery is made, patients have very limited interaction with their surgeon until the time of the operation up to two years later.

A study conducted by researchers at Stanford University and the University of Toronto on shared decision-making between orthopaedic surgeons and patients offered insights into how time constraints impacted the surgeon-patient relationship (Braddock et al., 2008). The study sample comprised 89 surgeons, mostly male (99%), and 133 patients, primarily female (74%). Of the 144 audiotaped discussions about surgery, surgeons discussed reasons for the recommendation to have surgery (92% of the time), alternatives to surgery (62%), and risks and benefits (59%). Rare were discussions about the patient's role in the surgery and recovery (14%) or the degree to which the surgeon gauged the patient's understanding about the decision to have surgery (12%).

Two interesting aspects of Braddock et al. (2008) relative to the current study are time and communication training. The median duration of the visits was 16 minutes and the range was 3 to 76 minutes (Braddock et al., 2008). It is important to keep in mind that this was a discussion about the surgeon's recommendation and patient's decision to have surgery of the knee, hip, wrist or hand, shoulder, or arthroscopic surgery, in which a longer discussion might be expected because expected outcomes are explained, surgical risks are discussed, and patients' questions are addressed. The second interesting aspect was that the surgeons reported having little or no prior training in communication skills, whether in medical school, residency, or in practice. This observation was echoed by Tongue et al. (2005) who referred to a 1998 survey by the AAOS of 807 patients and 700 orthopaedic surgeons in the US. Approximately 75% of the orthopaedic surgeons in the

survey believed that they communicated satisfactorily with their patients, but only 21% of the orthopaedic patients reported satisfactory communication with their surgeons. The gap was most evident in categories such as listening and caring, and time spent with the patient (Tongue et al., 2005).

A study in the UK assessed communication skills exhibited by rheumatologists and orthopaedic surgeons and how they correlated with patient satisfaction (O'Neill, Williams, & Kay, 2003). Looking at the results of the orthopaedic surgeon-patient interactions, the median duration of the visit was 10.5 minutes with a range of 4-26 minutes for elective surgery consultations. Linear regression analysis showed that the duration of the consultations correlated positively with an objective structured clinical and communication skills evaluation score of the surgeons ($p < .004$), which in turn were highly correlated with patients' satisfaction ($p < .05$). Contrary findings have been reported elsewhere. For example, in a systematic review of the literature on surgeon-patient communication, Levinson, Hudak, and Tricco (2013) discussed one study in which researchers found that when surgeons directly addressed patients' mentioning of a concern or worry, the visits were shorter than when the concern or worry was not addressed. The authors speculated that it was possible that "patients whose worry was addressed were able to put the concern to rest more quickly than those whose concern was unaddressed" (Levinson et al., 2013, p. 15).

Tongue et al. (2005) highlighted the importance of surgeons building rapport with patients through enhanced communication, which among other benefits for patients, may improve patient's treatment adherence, thus reducing follow-up visits for complications or adverse outcomes. Good communication "is the bedrock of quality medical care.

Essential communications cannot be delegated” (Tongue et al., 2005). Good communication can also help surgeons better understand their patients’ expectations, which in turn can contribute to patient satisfaction. Developing good communication skills has not been a priority the medical training of surgeons and may not occur naturally for surgeons whose focus has been on developing technical skills and clinical aptitudes. Therefore, a tool to aid surgeons in communicating with their patients about expectations for outcomes would benefit both patients and surgeons alike. It is proposed here that a communication checklist is such a tool.

2.6 Checklists in Health Care

A checklist is “an organized tool that outlines criteria of consideration for a particular process. It functions as a support resource by delineating and categorizing items as a list—a format that simplifies conceptualization and recall of information” (Hales, Terblanche, Fowler, & Sibbald, 2008, p. 22). Adopted from the aviation industry and the military, where procedural consistency is important, checklists have shown notable utility in health care delivery, especially in complex situations when time and allocation of resources are precious. Surgeon Atul Gawande noted in his bestselling book about the development of a surgical safety checklist for the World Health Organization (WHO), that checklists in medical care owe much to the aviation industry which is high in complexity and yet, “sick people are phenomenally more various than airplanes (Gawande, 2010, p. 35).

Checklists are currently used in many health care settings including surgery, intensive care, and trauma units, as well as for hospital discharges and patient transfers, and have been shown to reduce mortality, complication rates, injuries, and other serious adverse

events (Health Research & Educational Trust, 2013). The surgical safety checklist developed for the WHO reported by Haynes et al. (2009) was implemented and tested in eight hospitals worldwide, after 1 year, rates of post-surgical complications and mortality were reduced by over 36%.

Wolff, Taylor and McCabe (2004) reported on another practical application of a medical checklist in which evidenced-based guidelines were incorporated into clinical care pathways for heart attack and stroke patients in one Australian hospital. Over a 2-year period, compliance with key process measures that had been identified as appropriate for each stage of the patient's condition was recorded in patients' health records. Of the five process measures for heart attack (e.g., fasting lipid levels measured) and four process measures for stroke (e.g., dysphagia screening within the first 24 hours of admission), in all but one measure, the proportion of patients who received the key interventions increased significantly after the introduction of the checklist, and the increases were maintained over the following 2 years (Wolff, Taylor, & McCabe, 2004). The one measure that did not show an increase was one that already had 100% compliance but to exclude it from the evaluation would have been inappropriate for a clinical care pathway for stroke patients.

The benefits of checklists include: (1) assuring consistency in standards of care; (2) condensing a large amount of information into an accessible format; (3) reducing the potential for errors of omission; (4) improving the quality of care; and (5) facilitating the use of evidenced-based guidelines into clinical care pathways (Hales et al., 2008). The downside of checklists is that they may create complexity when situations need not be

complex or may create ‘checklist fatigue’ if the content or format is untenable for the end users (Hales et al., 2008).

Despite a number of examples of the benefits of using medical checklists (Gawande, 2010; Haynes et al., 2009) and the observation that there are no published findings of any detrimental contributions of checklists in medical care (Hales et al., 2008), there is limited information on the development of medical checklists themselves. This gap was addressed by Hales et al. (2008) wherein they reviewed over 1,000 abstracts and from there, identified 178 sources for detailed review to “delineate the standard components of successful checklists that can be used as a template in the development of case-specific medical checklists” (Hales et al., 2008, p. 22).

The development of a checklist begins with defining the goal of the checklist, which in turn establishes the structure and content of the checklist according to Hales et al. (2008). The considerations for formatting a checklist include: *context*, how and where will it be used, and by whom; *content*, the inclusion of peer-reviewed guidelines, evidence-based practices, literature reviews, patient input in some cases, and local policies and procedures if required; *structure*, a logical and functional presentation, reflecting the reality of clinical practice; *design*, using legible fonts sized appropriately, using white space to maximize legibility, and incorporating institutional logos if necessary; *utility*, appropriateness for the clinical environment, not too time consuming, and should be pilot tested (Hales et al., 2008). Keeping the end user of the checklist in mind is of ultimate importance. To facilitate uptake, “checklist designers or authors might also consider developing an educational plan that introduces the main concepts of the checklist to the candidate users, in combination with a promotional plan to increase

awareness of the checklist” (Hales et al., 2008, p. 28). In sum, checklists are comprised of equal parts evidenced-based guidelines, psychology, graphic design, and marketing.

None of the literature reviewed on medical checklists showed use within the context of orthopaedic surgeon-patient communication. One study, however described the use of a two-way communication checklist that schizophrenia patients completed to indicate the topics they wanted to discuss with their clinician, the clinician then used the checklist to discuss items with the patient and make adjustments to the treatment plan if needed (Van Os et al., 2004). One hundred and thirty-four patients were randomized to either the standard of care group or the intervention group. The outcomes measured were the quality of patient-clinician communication as rated by the patient, and change in the management of the case, as reported by the clinician. As hypothesized, patients in the intervention group rated communication with their clinician as significantly better than patients in the standard of care group, and patients in the intervention group were more likely to have had their treatment changed, as reported by the clinician than were those in the standard care group (Van Os et al., 2004). In the analysis of individual needs, interestingly, the need for information about illness and treatment had the greatest effect size compared to the other items on the scale. One other notable difference was that the duration of the visits was 13 minutes longer on average for the intervention group. This study illustrated that a simple intervention that consolidated the needs and concerns of schizophrenia patients during routine follow-ups improved patient-clinician communication, and in turn, facilitated the fine-tuning of the patient’s care plan through ongoing and reciprocal collaboration between patient and clinician.

To conclude the literature review for this study, age and sex/gender differences have been reported in the osteoarthritis (OA) and total knee replacement (TKR) literature. However, the literature on age and sex differences in TKR expectations and satisfaction is much more heterogeneous. Surgeon-patient communication is an important component of patient satisfaction, yet its influence has not been extensively studied or fully explained in the orthopaedic literature. Checklists have been shown to be useful in a number of health care contexts but have received very limited attention in provider-patient communication, especially in orthopaedic care. Thus, this study proposed taking a systematic approach, encompassing all of these factors in the development of a practical communication tool, namely a checklist that was hypothesized to enhance patient satisfaction via the management of patients' post-operative expectations.

3.0 QUALITATIVE STUDY

3.1 Introduction

A review of the orthopaedic literature reveals limited research on patients' post-TKR experiences (Marcinkowski, Wong, & Dignam, 2005). Indeed, a metasynthesis reported only 16 qualitative studies of patient experiences published between 1950 and 2010 (Perry et al., 2012). Therefore, the aim of the qualitative study was to investigate a small group of patients' TKR recovery as they were experiencing it, in order to deliver insights into TKR recovery from the patients' perspective and provide the foundation for the second study within the larger mixed methods study.

Giorgi's (2009) descriptive phenomenological method in psychology was used to investigate four participants' experiences recovering from total knee replacement (TKR). An additional four participants were interviewed using the same interview protocol as the Giorgi (2009) method and directed content analysis was used with the eight interview transcripts to identify potential items for the communication checklist. The directed content analysis approach is discussed in detail in Chapter 4 Checklist Development.

The use of the Giorgi (2009) method in patient-oriented research can provide insight into how met or unmet expectations contribute to patient satisfaction. The present study focused on patients' post-operative experiences recovering from TKR, as it was believed perspectives might change as a result of surgery, leading to readjusted expectations.

3.2 Philosophical Assumptions and Interpretive Framework

Ontology and Epistemology. Philosophical assumptions and interpretive frameworks are based on the concepts of ontology and epistemology, or respectively, "what we can know and how we know it" (Meyrick, 2006, p. 803). Some of the important

epistemic questions for researchers are: “What counts as knowledge? How are knowledge claims justified? What is the relationship between the researcher and those being researched?” (Creswell, 2013, p. 21). The alignment of epistemology and methodology is an indication of methodological rigour because the researcher’s epistemic stance influences the participant-researcher relationship (objective or reflexive), the degree to which the participant and the researcher are given voice in the research, and the standards used to establish the quality of the research (Carter & Little, 2007). Ontology and epistemology are concepts discussed more within the qualitative research paradigm than the quantitative perhaps due to the diversity and heterogeneity that exists in qualitative methodologies, and the resulting need to clarify philosophical influences, or because the quantitative research paradigm has mainly a positivist or post-positivist orientation, and as such, these assumptions are implicitly understood. Since the current study applied an equal-status sequential mixed methods design that began with a qualitative study, it is appropriate to outline the philosophical assumptions and interpretive framework that guided the qualitative study.

Realism-Pragmatism. Training shapes the values and perspectives of the researcher, which ultimately influences the type of research that is carried out (Cohen & Crabtree, 2008). My undergraduate training focused mainly on quantitative research methods in psychology with a specific focus on adulthood and ageing, and my ongoing work as a researcher in orthopaedic surgery exposed me to positivist-influenced research. Positivism is the belief that knowledge is acquired with observable facts rather than subjective experience and what counts as knowledge is captured through sensory information. Despite this influence in my day-to-day work I align more with the realist

paradigm as described by Cohen and Crabtree (2008), and the pragmatic interpretive framework described by Creswell (2013). Realism “adopts a philosophy of science not at odds with the commonly held ideals of positivism” (Cohen & Crabtree, 2008, p. 336). A positivist worldview is orientated in objective knowledge, is concerned with issues of prediction, generalizability, and applies deductive methods. The realist perspective proposes that there is “one reality that can be observed, and this reality is knowable through the process of research, albeit sometimes imperfectly” (Cohen & Crabtree, 2008, p. 334).

Pragmatism’s aim is to focus “on the practical implications of the research and will emphasize the importance of conducting research that best addresses the research problem” (Creswell, 2013, p. 29). Pragmatist researchers acknowledge the contexts that situate the research question and how it is investigated. These contexts may be social, historical, economical, or political. The focus on how best to address the research question means that pragmatism allows researchers the freedom of choice in terms of methods, techniques, and procedures for data collection and analysis. A major tenet of pragmatism is that quantitative and qualitative methods are compatible, even mutually reinforcing, and their corresponding numerical and textual data contribute to a more fully explicated understanding of the research problem (Creswell, 2013). As Schoonenboom and Johnson (2017) noted, “by successfully conducting an equal-status study, the pragmatist researcher shows that paradigms can be mixed or combined, and that the incompatibility thesis does not always apply to research practice” (Schoonenboom & Johnson, 2017, p. 113).

Epistemology determines how knowledge is acquired and justified, and it also dictates the nature of the relationship between “the investigator and the investigated” (Lavery, 2003, p. 26). From this purview, the epistemic stance of a realist-pragmatist is one in which the primary focus is on the “actions, situations, and consequences of inquiry”, (Creswell, 2013, p. 28). A realist-pragmatist seeks to understand the research from the perspective of the researched, and the impact it has. This has particular relevance when viewed through the lens of patient-oriented research. In 2011, the Canadian Institutes of Health Research made patient-oriented research a strategic priority, which “encompasses both clinical research and health services research, the synthesis, dissemination and integration of this new knowledge into the health care system and into clinical practice” (CIHR, 2011, p. 1). Realism-pragmatism is well suited for the multidisciplinary/interdisciplinary research approach that is required for patient-oriented research.

3.3 Theoretical Framework

In order to understand the theoretical frameworks that guide this study, context must first be set using two interrelated models of health and illness that are prominent in different aspects of health care and health services research today. These are the biomedical and biopsychosocial models of illness and health. To understand the biopsychosocial model is to first situate it within the context of the more ubiquitous biomedical model. The biopsychosocial model, in turn lays the foundation for the theory of lifespan development, which is the third theoretical framework of this study.

Biomedical Model. The biomedical model has been the dominant explanatory model of illness and health over the past few centuries and still holds considerable prominence

today. It conceptualizes health and illness as physiological processes, illness and disease are explained as a disruption of these processes that either cause, or are caused by, injury, biochemical imbalances, or infection (Borrell-Carrió et al., 2004). The biomedical model operates within a core set of assumptions which purport that, “all illness has a single underlying cause, disease (pathology) is always the single cause, and removal or attenuation of the disease will result in a return to health” (Wade & Halligan, 2004, p. 1398).

Although the biomedical model has led to many great achievements in health care and the cure of disease, its greatest strength is also the source of its greatest criticism. This criticism centres on its reductionist approach. Illness is viewed as a linear cause and effect process, with the body separate and distinct from psychological and social influences. What cannot be explained by cellular or molecular pathology is downplayed or disregarded (Borrell-Carrió et al., 2004). An unintended (or perhaps intended) consequence of this approach is that the reductionism often extends to the patient. In the biomedical model, the role of patient is that of the submissive recipient of medical intervention and not a co-contributor to his or her own health outcomes (Wade & Halligan, 2004). Furthermore, because of the link between clinical practice and health care research, the biomedical model often fails to properly recognize the central role of the patient as participant in (not subject of) research.

Biopsychosocial Model. A shift in the valuation of the role of the patient is one of the hallmarks of the biopsychosocial (BPS) model. In his seminal 1977 paper, George Engel argued for a more holistic view of the patient, one that would “reverse the dehumanization of medicine and disempowerment of patients” (Borrell-Carrió et al.,

2004, p. 576). Engel proposed a contextual and cross-disciplinary approach in his tripartite model where “the physician’s basic professional knowledge and skills must span the social, psychological, and biological, for his decisions and actions on the patient’s behalf involve all three” (Engel, 1977, p. 133). Engel’s call for a contextual, cross-disciplinary approach is where the two models of health and illness link to lifespan developmental theory, the other theoretical framework of the study.

Lifespan Developmental Theory. Lifespan developmental theory as conceived by Paul Baltes and others originated from a sub-category of developmental psychology called lifespan developmental psychology, which focused on the study of human development beyond the traditional areas of childhood and adolescence. Lifespan developmental psychology, or lifespan psychology (Baltes, 1987; Baltes & Smith, 2004) has become its own sub-discipline of psychology. Lifespan psychology is defined as “the study of constancy and change in behavior throughout the life course (ontogenesis), from conception to death” (Baltes, 1987, p. 611). While lifespan psychology has been studied empirically since the 1960s and 1970s (Baltes, Lindenburger, & Staudinger, 2006; Overton, 2010), discourse on lifespan development dates back to the 1700s (Baltes, 1987; Baltes et al., 2006; Baltes, Staudinger, & Lindenberger, 1999). Lifespan psychology proposes an “integrative perspective on development as a multidimensional, multidirectional, context-specific, and malleable phenomenon that goes beyond classic conceptions of a linear, unidirectional growth or differentiation” (Lang, Rohr, & Williger, 2011, p. 59).

Tenets of Lifespan Psychology. Baltes (1987) identified and later adapted (Baltes & Smith, 2004) seven key concepts that comprised the theoretical taxonomy of lifespan

psychology, which include: 1) lifespan development as a life-long process of changes in adaptive capacity; 2) multidirectionality: at any given time or developmental stage, there can be increases and decreases in functioning; 3) development as being comprised of gains and losses over time rather than increasing gains until mid-adulthood then slow declines into old age; 4) plasticity, also known as, “within-person modifiability” (Baltes, 1987, p. 613), explains how individuals can change as the result of cumulative life events and experiences; 5) historical imbeddedness: frames the role of history and culture as variables that impact development; 6) contextualism as a paradigm: there are age-graded, history-graded, and non-normative life events which influence development; and finally, 7) development as multidisciplinary: the study of development can encompass a variety of perspectives, each having the potential to influence and be influenced by the others. These tenets of lifespan developmental theory provide a more comprehensive understanding of people of all ages and developmental stages. More importantly from a health services research perspective, the application of lifespan developmental theory can provide valuable insights into what patients may be experiencing at a particular time of life or health stage.

How does the theoretical frameworks outlined above inform this study? Lifespan developmental theory builds on the biopsychosocial model and can guide health care research, and in particular, orthopaedic research with persons in different life stages. For example, lifespan developmental theory provides a new lens with which to consider the “outcomes” or expectations for a particular health care intervention. In the traditional biomedical model, the ideal outcome is when the patient is cured, i.e. the damaged knee is replaced with a prosthesis, which replicates the structure and biomechanics of the joint.

In the real world of aging and chronically ill populations, the interplay of psychological well being, physical status, and the social determinants of health reflect the importance of the biopsychosocial model. If the total knee replacement was a success from the surgeon's perspective via radiographic evidence and the patient's responses on pain and function scales, but the patient's expectations were not met and he or she regrets having the surgery, was the intervention a success? Lifespan developmental theory derives from a philosophical perspective of contextualism and thus, recognizing the influence of context can help identify factors that may affect patient expectations and outcomes, however these outcomes are subjectively defined.

As Dorr and Chao (2007) noted, surgeons' views of osteoarthritis often have a more biomedical orientation, the knee joint is damaged and must be replaced. After the knee replacement, function and well being will be restored. From the patients' perspective, the disability caused by an osteoarthritic knee has wider implications that encompass psychosocial variables, which are important for overall quality of life. "Surgeons need to remember their view of arthritic dysfunction as a break-down of a machine-like body they can fix with their operation differs from the patient's view that their dysfunction is a psychological problem disrupting their ability to live in their normal style" (Dorr & Chao, 2007, p. 10). This misalignment of views is what the present study seeks to address through the development and testing of a communication tool that is hypothesized to help bridge the perspectives of surgeon and patient.

3.4 Role of the Researcher

In qualitative research, the role of the researcher is expressly stated, in contrast to quantitative research. As this is a mixed methods research design that begins with a

qualitative study, the role of the researcher will be discussed and reviewers who are surprised by this are reminded that the researcher's role across the qualitative and quantitative studies, like the two studies themselves, is different but not contradictory.

In the qualitative study, my role as the researcher was participatory due to the "sustained and extensive experience with participants" (Creswell, 2003, p. 184). During the consenting process and in the interviews, I fostered an amiable association with the participants to ensure each felt comfortable and secure in discussing their experiences. This may have inadvertently introduced the possibility of subjective interpretations and created a potential for bias (Locke, Spirduso, & Silverman, 2007).

In the quantitative study, I conducted the consent meetings with the checklist participants, coordinated and managed the checklist intervention and administered and collected the satisfaction surveys with both groups by mail, so there was limited direct involvement with the quantitative study participants. Data analysis was performed using rigorous statistical analysis techniques and the results were interpreted based on the established values for the statistical significance of the functions.

It is worthwhile to note that I have neither experienced osteoarthritis or total knee replacement surgery, nor has any of my family members, but as a research coordinator in orthopaedic surgery, my work involves frequent interactions with patients who experienced living with osteoarthritis and experienced waiting for, and undergoing TKR. The possibility of bias may have occurred due to the sustained interaction with patients in other research studies such that patients' experiences with TKR and with the health care system overall may be prioritized. Conversely, one might argue that because of ongoing interactions with surgeons, bias may have resulted there as well (i.e., prioritizing the

surgeons' perspective by focusing on the need for "efficiency" in meetings with patients because of a greater awareness of the influence of the fee for service model). Reflecting upon these two contributing and possibly conflicting biases, I believe instead that a constructive tension was created which resulted in a sustainable balance so that neither perspective was unduly prioritized. Furthermore, this broader perspective may have also ensured that the methodological rigour needed across both studies in this mixed methods research was established and maintained.

3.5 Research Questions

The research question of the qualitative study asked, "*What are the essential features of the experience of recovering from TKR?*"

3.6 Methodology

The Descriptive Phenomenological Method in Psychology (Giorgi method; 2009).

The Giorgi (2009) method is one among a number of approaches within a larger research method known as descriptive phenomenology, a subset of phenomenology, which itself is both a philosophy and a research method. In general, there are three signature aspects of descriptive phenomenology, (1) a phenomenon is described exactly as presented, "neither adding or subtracting from it" (Giorgi, 1992, p. 121); (2) an "attitude of the phenomenological reduction" (Giorgi, 1992, p. 121) known as bracketing is adopted. Husserl's term for bracketing was *epoché* (Creswell, 2013) and it prescribes that any past knowledge or perceptions about a phenomenon be set aside; and (3) there is a belief in the concept of universal essences, or shared features of an experience. Therefore, the task of descriptive phenomenology is to identify the commonalities which reveal the core essence of the experience (Lopez & Willis, 2004). The essential question of descriptive

phenomenology is, “What is this experience like?” as it attempts to unfold meanings as they are lived in everyday existence” (Lavery, 2003, p. 22).

Amedeo Giorgi’s eponymous method was conceived in the 1970s and has been continually explicated over the years through numerous publications (Giorgi, 2009). The method derived from Giorgi’s training as an experimental psychologist and from Husserl’s philosophical teachings of an objective, rigorous approach to understanding subjective human experience, by adapting “a pre-existing philosophical method in such a way that it could be used for studying psychological phenomena within a scientific context” (Giorgi, 2008, p. 34). The method draws from philosophy, science, and psychology (Giorgi, 2009) and the application of the method, says Giorgi, produces knowledge that is scientific because it is “general, methodical, critical, and systematic” and furthermore, Giorgi contends that “replicability is possible” (Giorgi, 2000, p. 6). For simplicity, Giorgi’s 2009 book will be the main reference for describing the steps of his method although it should be noted that numerous earlier publications exist that describe both his method and its application in research.

The systematic and prescribed steps of the Giorgi (2009) method begin with the collection of data in the form of transcripts from participants’ verbal (audio recorded) or written responses to a general question about the phenomenon of interest. The main question for participants directs focus on a specific situation that relates to “the lived-through experience” (Giorgi, 2009, p. 125). The question is purposefully broad (i.e., *please describe for me a situation in which you experienced X*), Giorgi, 2009) and is intended to elicit a description that portrays the figural aspects of an experience, although some embedded parts of the lived-through experience do not get portrayed. The

relationship is likened to that of the Gestalt ‘figure-ground’ perception (Englander, 2012) although “not all of the ground can ever be expressed” (Giorgi, 2009, p. 125). Thus what is meaningful about the situation gets expressed because the broadness of the question allows the participants themselves to determine what is meaningful. In Englander’s (2012) example of his descriptive phenomenological study of early emotional memories, the main question was to describe a lived situation of an early emotional memory, the follow-up question concerned the “lived effect” of the recalled situation on the participants. Whitsitt (2009) took a similar approach in an exploration of the lived experiences of three couples wherein one of the partners had undergone coronary artery bypass graft (CABG) surgery. In Whitsitt (2009), the main question asked about how CABG was experienced by the couple, and the follow-up questions focused on how the couples coped with CABG, and the significance of experiencing it as a couple.

Giorgi recommended a minimum sample size of at least three participants “because a sufficient number of variations are needed in order to come up with a typical essence” (Giorgi, 2008, p. 37). Purposeful sampling was used which is common in many qualitative methodologies, which means “the inquirer selects individuals and sites for study because they can purposefully inform an understanding of the research problem and central phenomenon in the study” (Creswell, 2013, p. 300).

Creswell (2013) described analyses in descriptive phenomenology as beginning with the researcher reflexively describing his or her own experience so that it can be set aside or ‘bracketed’. The transcript is reviewed for significant statements which are grouped into “larger units of information called meaning units” (Creswell, 2013, p. 193). A ‘textural description’ is then written, which is the researcher’s description, or the ‘what’

of the experience. A structural description, or the 'how' of the experience is written next. The final step is a composite description that includes the textural and structural descriptions that comprise the "essence of the experience" (Creswell, 2013, p. 194). In this and other approaches, an audit trail in the form of a research journal is recommended to capture observations, thoughts, and feelings of the researcher as the research unfolds.

Participants

A purposeful sampling strategy was used to recruit patients at 6 weeks up to 6 months post TKR. Patients were recruited from one orthopaedic surgeon's practice in a community hospital setting. Inclusion criteria was patients, aged 45 and older with end-stage osteoarthritis who had a primary TKR; could effectively articulate their TKR experiences in English; were able to provide written informed consent; and willing to participate in a lengthy interview about their TKR experience. The exclusion criteria were significant health co-morbidities that by the surgeon's determination made the potential participant less representative of the TKR patient population, an inability to provide written informed consent, and an inability to be available for an audio recorded interview in a private meeting room at the hospital, in the participant's home, or by telephone.

Materials

Materials for the qualitative study included the informed consent form (Appendix II); the interview protocol (Appendix III); a password protected computer with an audio recording application; USB microphone; a notebook for the researcher to make notes during the interviews; headphones for transcribing the audio recordings; word processing software for interview transcription and analyses.

The interview protocol followed Giorgi's (2009) method, which included one main question and three follow-up questions. This approach is advised when the description of the phenomenon is being explored, and also when the effect of experiencing the phenomenon is being explored (Englander, 2012). Therefore, within the context of patients' recovery from TKR, the main interview question was, "*Please tell me about a specific situation or event that illustrates your experience so far in the recovery from your knee replacement surgery. Please be as specific and as detailed as possible*". The follow-up questions were, (1) "*Can you tell me about a situation or event when you were concerned or unsure about what to do in terms of your recovery?*" (2) "*Is there any information that you wish you had known during your recovery?*" and (3) "*Is there anything you wanted to ask your surgeon but didn't have the chance to?*" If any response required clarification or explication, the question, "*Can you tell me more about... X?*" was asked, with X indicating the use of the participants' own words so there would be no risk of interpreting the participants' statements.

Procedure

Following the principle of purposeful sampling, the orthopaedic surgeon identified patients best able to describe the phenomenon under investigation. The surgeon presented the study to the patients during their initial post-operative clinic visit where he introduced the researcher who in turn, explained the study in more detail and reviewed the informed consent document. If the patient agreed to take part, the informed consent form was signed and a copy was given to the patient. Englander (2012) recommended the consent meeting and the interview meeting be staggered to allow the researcher to establish trust with the participant, and answer any questions that may arise once the potential

participant had time to reflect on their choice to participate. After the informed consent form was signed and a copy provided to the participant, the researcher then scheduled the interview and provided the main interview question. Englander (2012) advised that it is helpful to review the interview question to give the participant time to “dwell and ponder on the experience” (Englander, 2012, p. 27) thereby providing a richer description during the interview without the researcher having to ask too many questions. Only the main interview question was presented before the scheduled interview session.

The interviews were held in a private meeting room at the hospital, at the participants’ own home, or by telephone, whichever was most convenient for the participant. During the interview, the interview questions were presented in a standardized format and the interviews were digitally recorded as an mp3 file on a password protected computer. Each interview was assigned a code number for transcription and the researcher transcribed all of the interviews, as recommended by Giorgi (2009) because he deemed it necessary for the researcher to be fully immersed in the data.

Giorgi (2009) noted the importance of understanding the difference between ‘directing’ the participant to (or back to) the phenomenon of interest and ‘leading’ the participant to things that the researcher might be expecting in the data. “To direct a participant to a specific zone of experience is not prejudicial because, in the discovery approach used by phenomenological researchers (as opposed to a hypothesis-testing approach), the researcher does not care what the specific details or contents are, only that they are genuinely revelatory of the experience being researched” (Giorgi, 2009, p. 123).

Data analysis. The systematic and prescribed steps of the Giorgi (2009) method were followed, which involved reading the transcript numerous times to get a sense of the whole, identifying meaning units in the data, and transforming the meaning units that were in the participants' own words into "psychologically pertinent expressions but without using the jargon of mainstream psychology" (Giorgi, 2009, p. 137). Here everyday language was used to express the psychological content of the meaning units. It was at this stage that the lens of the theoretical perspectives of the biopsychosocial model of health and illness and lifespan developmental psychology were applied to synthesize the situated structural description of the participants' experiences. From there general structural constituents or themes were identified. These formed the basis for the general structural description of the phenomenon, which was described as "a condensed, higher level structure that captures the essence of the experience across individual descriptions" (Whitsitt, 2009, p. 148).

Methodological rigour. To ensure the trustworthiness and credibility of the findings, Creswell (2013) recommended using at least two of eight validation strategies frequently used in qualitative research, these included: prolonged engagement and persistent observation, triangulation, peer review or debriefing, negative case analysis, reflexivity (clarification of researcher bias), member-checking, thick description, and external audit.

In this study, three of Creswell's (2013) eight strategies were used and are briefly explained here: (1) rich, thick description: the nature of the Giorgi method yielded detailed descriptions of the participants' lived experiences with the phenomenon under investigation which allows readers themselves to determine "whether the findings can be transferred" (Creswell, 2013, p. 252) to other settings and contexts; (2) Reflexivity: this

involved the researcher stating her own biases and any influences that might inform, explicitly or implicitly, the descriptions. This is the concept of bracketing described earlier that is central to the Giorgi method and to descriptive phenomenology at large. The researcher's bracketing for this study was discussed in section 3.4; (3) Peer review/debriefing: The dissertation co-supervisor (O.G.), who did not take part in the recruitment of participants, data collection, or qualitative analyses, provided an objective review of the Giorgi analyses. Acting as a peer reviewer/debriefer as recommended by Creswell (2013), the peer reviewer/debriefer read the original de-identified transcripts and the analyses, in order to ask hard questions about the methods used, and the descriptions and interpretations obtained. This also provided "the researcher with the opportunity for catharsis by sympathetically listening to the researcher's feelings" (Creswell, 2013, p. 251).

Unlike some other methods used in qualitative research, neither the transcripts nor the analyses were returned to the participants for comments as Giorgi argued against this practice (Giorgi, 1992). Tatano Beck (1994) provided a detailed rationale for Giorgi's position, stating that, "To ask participants to evaluate a psychological interpretation of their own descriptions, either implicitly or explicitly, is viewed by Giorgi as exceeding the role of participant. For Giorgi, casting the participant into the role of evaluator overlooks the fact that participants describe experiences from an everyday perspective" (Tatano Beck, 1994, p. 259). Moreover, the intent of the Giorgi (2009) method is to capture participants' descriptions of the phenomenon as they experienced it in a particular moment in time. To go back and review it later would be akin to stepping outside of the description of the experience and traversing into an interpretation of the experience.

3.7 Results

As described in greater detail in the methodology section, the Giorgi (2009) analysis was a five step process: (1) transcripts were read multiple times to get a sense of the whole; (2) meaning units were identified and transformed from the participants' words into expressions that reflected the essential element of each description; (3) these expressions were transposed into a situated structural description (SSD) for each participant; (4) higher-level analysis was used to identify the general structural constituents or themes from each SSD; and finally, (5) the themes were synthesized into one general structural description of the experience across all participants. The researcher (S.G.) carried out steps 1, 2, 3, and 5 with supervision from co-supervisor C.A-R. and both collaborated on step 4. As an external review, co-supervisor O.G. reviewed the original, de-identified transcripts and the subsequent analyses.

The participants were three women and one man (mean age 58.5 years) with a mean time from TKR surgery of 9.75 weeks. Table 1 shows the demographic information for each participant listed by the alphabetically ordered pseudonym given to each.

Table 1
Participant Characteristics Giorgi (2009) Method

Study ID #	Participant pseudonym	Age	Sex	Post-TKR weeks	Marital status	Employment status
001	Andrea	66	F	6	Ma	R
002	Brenda	55	F	7	S	FT
003	Cynthia	59	F	14	Ma	R
004	Alan	54	M	12	Ma	FT

Note. TKR = total knee replacement. F = female. M = male. Ma = married. S = single. R = retired. FT = employed full time.

The mean duration in minutes of the recorded interviews was 39 minutes (range 26 to 69 minutes). As noted above, the researcher transcribed all of the interviews in order to be fully immersed in the data (Giorgi, 2009). In total there were 88 typed pages of transcriptions from the four interviews.

Situated structural descriptions. A situated structural description (SSD) for each participant is presented below.

Participant 001: “Andrea”, age 66 at the time of interview, 6 weeks post-TKR.

Andrea described feeling uneasy recounting a situation that occurred during her recovery from her TKR as she felt it could be interpreted as a grievance, which she said was not indicative of her overall experience. The experience Andrea discussed concerned her post-operative hospital care and can be viewed through the lens of personnel and system issues. Andrea felt very vulnerable due to post-anesthesia confusion and the nausea and vomiting that ensued. She perceived a lack of empathy from some members of the health care team, which left her feeling powerless and frustrated as she sensed no one person was responsible for her care. Simple comforts such as appropriate room temperature, being given a proper sized vessel in which to vomit, and ice packs to reduce her knee swelling were not offered but had to be specifically requested. Andrea rationalized these as personnel issues resulting from understaffing or overwork due to the holiday weekend. Personnel and system issues intersected resulting in what she described as the right person not doing the right job at the right time. An additional system issue Andrea encountered was inconsistent dispensing of pain medication which manifested in a catch-22 scenario of the frustration of needing pain medication, being told it was not due yet, yet upon asking if she could request it when it was due was told she could not request it

ahead of time. Compounding the issue further was a medication recording error that resulted in a two-hour delay of pain medication. The personnel issues Andrea experienced had a reciprocal and reinforcing relationship with the system issues. Despite the challenges she faced with the care she received in hospital, she stated it did not impact her recovery in the long term.

Breakthrough pain was a concept introduced and stressed in the pre-op admission clinic so it became a concern for Andrea but to her surprise, it was never mentioned in the hours and days after her surgery. Pain management after discharge centered on learning to align the timing of her pain medication and her physiotherapy. Andrea felt she did not receive appropriate pain management strategies at discharge to optimize her physiotherapy regime. She also discovered the nature and level of daytime activity led to an increased need for pain medication at night. Concern over narcotic dependency was present in her mind, which led her to carefully monitor her intake.

Andrea accomplished the individual physiotherapy exercises prescribed but was not able to complete the suggested number of repetitions. This resulted in frustration and discouragement. She suggested that a personalized knee coach, who could assist the patient with navigating the first few post-operative weeks, would be highly beneficial. She said the knowledge she acquired from her experience with resuming instrumental activities of daily living after her first knee replacement would influence her pre-op planning for her second knee replacement.

Participant 002: “Brenda”, age 55 at the time of interview, 7 weeks post-TKR.
The situation Brenda described that illustrated her recovery from TKR was shoveling snow from her walkway, which made her realize that her mobility, previously

compromised by osteoarthritis, had been greatly restored by her TKR. It was significant to her that as her knee function increased she discovered a renewed sense of autonomy. Brenda contrasted this with her partial hearing loss, which she stated would never be regained. This is an example of one of the tenants of lifespan developmental theory, that development is a life-long process of changes in adaptive capacity.

A central theme of Brenda's TKR experience was how she navigated the health care system before and after her surgery. Pre-operatively, Brenda expressed feeling powerless because she was not able to adequately plan her medical leave with her employer and family members due to a system that provided only vague projections for a surgery date based on the surgeon's wait list. In an attempt to obtain more detailed information, Brenda experienced an unsympathetic gate holder of information, which made her question her self-perceived role as a "good patient". Brenda navigated the system post-operatively by adhering to this ideal, actively seeking not to burden the care team with requests while in hospital and after discharge being diligent in following and exceeding physiotherapy recommendations.

Brenda's belief in the importance of a positive attitude fueled her journey through the early weeks of her recovery period. She challenged herself to accomplish more by setting small, achievable goals and to build on her successes. Returning to work as soon as possible was a major incentive for Brenda. Even with her diligent effort she was surprised by how quickly she progressed with physiotherapy and returned to activities such as house and yard work.

From the perspective of pain management, the concept of planned analgesia was foreign to Brenda although she learned it was important to take the medication as

prescribed to best optimize her physiotherapy. She took the advice of her physiotherapists and understood the need to take pain medication even as she managed her fear of becoming dependent on the narcotics.

Brenda viewed the outcomes of others who had knee replacement surgery as context for her own recovery. Close others such as her father and a member of her extended family were positive sources while an acquaintance that had a difficult recovery was a cautionary example. She was also aware of the progress of other patients at the physiotherapy clinic at the hospital, and was encouraged by the feedback she received from others about how well she was progressing.

The situation Brenda described about her recovery was retrieving her mail on the morning of the interview. She described stepping out of doors and seeing that snow had fallen overnight, proceeded to clear her front steps and the walkway she shared with her neighbours. With the task completed, she noted with some astonishment that she had not taken any pain medication that morning. When asked to reflect upon this, Brenda said she believed this indicated the degree to which she had regained the mobility that had slowly diminished as the condition of her knee worsened, necessitating her TKR. She declared, "I have my life back". She described a renewed sense of autonomy for which she was most appreciative. She reported feeling amazed at her progress to date. Having earlier lost some of her sense of hearing that will never return, Brenda contrasted this with losing mobility due to her knee and then regaining it through her knee replacement surgery. Brenda recounted having a conversation with close friends over a decade ago in which each stated their worst-case scenarios. Brenda recalled describing her worse state as being incapacitated, which would be a severe detriment to her quality of life. Brenda

recalled with sadness, that her mother who had a previous hip replacement was scheduled for a TKR but had passed away before it happened so she was never able to enjoy its benefit. Brenda said her mother had 11 children and had always been extremely active until her joints simply wore out.

At 7 weeks after surgery, six different but interconnected aspects of Brenda's lived experience of TKR recovery were identified: (1) Pre-operative expectations and preparation; (2) the hospital experience; (3) pain management and medication; (4) physiotherapy; (5) surgeon's post-operative instructions; and (6) mental attitude.

(1) Pre-op Expectations and Preparation: Brenda reported having few preconceptions and relied on the advice of close others who have had knee replacement surgery. She said the primary exemplar was her father who had his knee replaced in his late 70s. Unsure about how much assistance she would require at discharge, Brenda enlisted her sister for home support. Brenda surmised she was likely more prepared than most for her recovery period, as she had readied a surplus of frozen meals; completed housekeeping tasks to ensure she would not be burdened with them upon her discharge from hospital, and once she was home she did only what she was capable of, such as light housekeeping. She stated her pre-op preparations provided peace of mind during her recovery period. Brenda shared a recollection that summarized her preparedness. Her sister asked her what she would like her to make for their evening meal. Brenda suggested they go "shopping in the freezer" and choose from a selection of meals Brenda had prepared prior to surgery. This elicited an incredulous laugh from her sister, who applauded Brenda's foresight. Brenda admitted this was both in keeping with her disciplined personality and was also the result of her professional training.

In discussing the preliminary consultation Brenda had with the surgeon, she recalled that she first saw a physiotherapist after the referral was made from her family physician to the surgeon. The physiotherapist recommended swimming as therapy, which Brenda undertook immediately. Swim therapy strengthened her leg muscles, which in turn, alleviated her knee pain so by the time she saw the surgeon she believed her knee to be much improved and reported to the surgeon that she felt she did not require surgery. She recalled the surgeon had warned her that this was only a short-term benefit of the swimming and her osteoarthritis would continue to worsen over time. She criticized herself for not being more realistic about her condition and not understanding the consequences of her decision not to have surgery at that time. She explained that soon after, she injured her Achilles tendon, which she described as a direct result of her unstable knee. At Brenda's second referral appointment, she consented to have surgery and was assured she would not have to wait the full 18- to 24-month wait time, for which she said she was very grateful. Having been told by the surgeon that she would likely be scheduled for the following May or June, she contacted the surgeon's office in June to inquire about her status and was told her surgery would likely be later in the fall. As she discussed coordinating her medical leave with her employer, Brenda considered the ripple effect on workload when one member of the team was absent and she also suggested this applied to home life as well. She reiterated that being able to plan for surgery is vital especially when others are impacted. She opined this may not be an issue for retired persons but then corrected herself, stating that retired people also have others who may be affected by the uncertainty of waiting for a surgery date.

(2) The hospital experience: Upon regaining consciousness after surgery, Brenda described being very lucid. She suggested this was similar to her normal sleep/wake cycle, she said her waking was always immediate with no interim states of grogginess. Commenting on the comparisons patients make with one another after surgery, Brenda said her father queried her on her lack of post-operative bruising as he had experienced a great deal of discoloration on his operative leg. Similarly, a friend of Brenda's who had a bilateral knee replacement noted how little bruising she had. Brenda responded that she was likely just fortunate.

Brenda described her hospital stay as positive and uneventful, she was able to accomplish the mobility requirements of physiotherapy quickly, which had been commented on by the health care team. This was in contrast to her hospital roommate who was much more incapacitated and required much more attention from the care team. Brenda explained that she often made her request to the care team at the same time as they were tending to her roommate so as not to burden them with extra work. She recalled that one of the care team had mentioned to her that she was one of the few patients who never used the bell to summon staff for assistance or requests during her entire hospital stay. Brenda said she would not hesitate to have her second knee replaced considering how well her hospital stay and recovery had been. She said she was very fortunate to have had such a positive outcome. When asked about how she managed her expectations as a patient, Brenda recommended that the surgeon and his administrative staff consider the journey up to and after surgery from the patient's perspective. She noted that while they must have to deliver the same information to numerous patients, from the individual patient's perspective, the information is new and often unfamiliar.

(3) Pain Management/Medication: At 7 weeks post-TKR, Brenda reported taking pain medication as needed. She had taken pain medication regularly for approximately four weeks and in that time she perceived herself more recovered than she actually was because the medication masked the pain of her Achilles tendon and her shoulder injuries, both of which had occurred while she awaited her TKR. She described the other pain as worse than her knee pain. Brenda recalled making the connection that it was important to train her muscles while taking pain medication to increase her endurance during her rehabilitation. Brenda remembered a day when she had neglected to take her pain medication before physiotherapy and how difficult it was to complete the exercises. She had vowed never to forget it in the future. Even though she continued to have pain, she stated this was her new reality as she returned to work after taking a medical leave of about five and a half weeks.

Brenda acknowledged she was prepared for the pain of surgery because she experienced the cumulative effects of pain from the wear and tear on her body and the various other injuries she had sustained. Brenda drew comparisons between the pain tolerance of men and women, recalling that her mother's was much higher than her father's. She said her father's pain threshold seemed to decrease after the death of her mother. Brenda said she too had a high threshold for pain, which she said her dentist had confirmed. She described having few preconceived notions of the pain experience. She spoke of adopting the post-operative pain management regimen advised by her physiotherapists in order to successfully complete the exercises that expedited her recovery.

Prior to the surgery, she reported only taking pain medication as needed so the concept of planned analgesia, although foreign, was heeded once she understood it would facilitate recovery. She recalled taking a little less medication than prescribed for her daily activities but always ensured she took the recommended dose prior to physiotherapy. Having never required much pain medication through the course of her life, she held the belief that analgesia should only be taken as needed so as not to develop a dependence. She said she believed dependency resulted from taking medication too early or too often and this was her concern.

(4) Physiotherapy: Brenda attributed her progress partly to having engaged in the recommended actions immediately upon waking in recovery. In the weeks prior to her surgery, Brenda readied herself by reviewing the exercises and instructions provided in the pre-op clinic booklet. She described these post-operative exercises as somewhat rudimentary compared to her swim therapy but did rehearse the breathing exercises because she felt her lung capacity was weak. Relatives and friends who had knee replacements counseled Brenda to be diligent with her post-operative physiotherapy. She stated this was a high priority for her even while in the post-anesthesia care unit (PACU). She said her sole motivation was to return as close as possible to her pre-disease state. She suggested that swimming prior to her surgery provided practice in adhering to an exercise regimen. Brenda reported a satisfactory physiotherapy experience, recalling how she took cues from the physiotherapists on how much to challenge herself when exercising. She said she neither challenged the directives nor engaged in self-doubt of her ability to complete the required exercises. When others cautioned she was overexerting herself, she responded that she was not exceeding anything the physiotherapists advised.

She reported attending physiotherapy at the hospital two times per week, which she felt helped her achieve her physiotherapy goals for the remaining days of the week. She valued the professional equipment at the physiotherapy clinic. Brenda recalled that her father spoke of the intense pain he experienced during his physiotherapy, which he did at home with the assistance of his partner. Brenda said her father doubted her ability to complete the exercises unaided and she herself was unsure because she witnessed her father's challenges and had only a cursory view of the experience of her acquaintances. Brenda quickly realized she could complete her at home physiotherapy unaided and reported that both she and her sister were astonished that the support they thought would be required proved unnecessary. Brenda stated she resumed her pre-operative activities such as swimming to aid in her return to the physical demands of her job especially because she was returning to work during a busy time of year. Brenda described the physiotherapy at the hospital as very challenging but very effective. She remarked that although the regimen did not change over the course of the physiotherapy, the physiotherapists made adjustments as she progressed. She noted individual differences in patients' progress that was not necessarily aligned with their post-TKR weeks and commented that this was also noted by the patients themselves as they conversed with one another. Brenda described the physiotherapists as being very conscientious, providing the explanations she required and addressing her many inquiries with more detailed information. She cited one occasion where she was attempting a certain exercise and did not understand its therapeutic value, only to learn upon further inquiry that she had been performing it incorrectly. Once corrected she quickly saw its importance. Brenda noted this was an example of how individual differences in cognition and recall

can be affected with age. She suggested that the ability to recall detailed instructions like the steps or positions for an exercise can be challenging even when one is involved in detail rich work as she was in her own profession.

Despite feeling she was prepared for surgery, Brenda stated she felt there were a number of imponderables. She described a friend whom she viewed as having an unsuccessful TKR outcome in part due her friend's noncompliance with her physiotherapy, as well as a negative disposition. She contrasted this with a member of her extended family of a similar age who had an excellent outcome and advised her to adhere to the physiotherapy regimen. She stated her father was also a strong advocate of physiotherapy and recommended daily post-operative walking but she noted he was challenged in that his recovery occurred during the winter months. Brenda speculated that winter must be difficult for older seniors recovering from TKR due to snow and ice that make sidewalks and streets treacherous. She mentioned that her father's other TKR resulted in a more prolonged recovery because the weather made getting out for exercise difficult, but 2 years after his surgery he was doing as well as he had with his first TKR.

(5) Surgeon's post-operative instructions: Brenda spoke of her astonishment when she was told the usual medical leave was 3 months. She stated that she was ill prepared for this information, and furthermore, the instruction that she could not drive for 6 weeks was equally astounding. Despite these recommendations, she returned to work at five and a half weeks because she was anxious to return to her duties to prepare for a hectic period at her workplace.

Brenda said she saw the surgeon before her discharge from hospital, on the day her staples were removed, and at 5 weeks after her surgery. Brenda stated she did not have

any issues with obtaining information from the surgeon because she readied herself for her discussions with him by organizing her inquiries and being diligent in obtaining the information she needed. Although Brenda described her interactions with the surgeon as matter of fact, she expressed appreciation for his optimism and conscientiousness. She stated she quickly realized that exchanges with the surgeon would be brief, face time was limited, and follow-ups were few. She suggested that for her, this limited access was not an issue but speculated that for older patients this might be a concern, especially those who might require more explanation or the opportunity to address concerns that were not explicitly stated. She cited the example of her own elderly father whom she viewed as requiring a different approach than what she herself required. Brenda speculated that perhaps the surgeon assessed his patients and adjusted his approach in accordance with the capacity he perceived each patient possessed.

(6) Mental attitude: For Brenda, proper mindset for recovery was important; this involved testing her progress periodically. Brenda recalled not being able to complete some yard work prior to her surgery but after her surgery she approached it with the attitude that she would only do what she was able. She recalled one particularly favourable day when she was approximately three weeks post-TKR; she began lawn and garden preparations for the winter. She explained that she shared common tasks with her neighbours and hers was the yard work and flowerbeds. She was able to complete half of the task and then after some unfavourable weather conditions completed the remaining work a few days later. She counseled herself to do only what she was able, and approached the task as a series of small chores not one large undertaking. She stated she was surprised and very pleased to be able to accomplish these tasks three weeks after

surgery. She stated she did not overexert herself, but used this as an opportunity to test her progress.

Brenda also expressed surprise with what she was able to accomplish in her first few post-operative days. She cited an example in the hours after her surgery wherein she was told she would need a catheter. She pleaded for the health care team's patience to allow her bladder to resume function on its own so she would not be burdened with the catheter. By the next day, she had no monitoring equipment and was fully mobile, even requesting the resumption of solid food. She suggested that the care team acquiesced to her request because she was persistent in advocating for herself. Brenda explained that even though she had an independent spirit, she knew that she could not overextend herself as she often did when she was younger. She said she now had a better sense of when to push herself and when to be cautious.

Brenda reported having few preconceived notions about her recovery, which may be why she was often amazed with her progress. She stated she was in good physical shape until age 50 and then described her early 50s as a time of worsening health because she felt she overworked herself for many years due to the rigours of her profession. She acknowledged being an overachiever at work and had been cautioned by her family physician to pace herself better but she did not heed the advice. She described a diminishing perseverance but suggested this would not impact her recovery since she was innately strong willed. She maintained that it was best to remain active and said optimism was essential to prevent feelings of self-pity, which she felt could occur during recovery from TKR. She further suggested that each patient is in command of his or her own recovery. In Brenda's view one's outlook significantly impacts one's recovery. She

likened it to confirmation bias when forming an opinion of others, if one seeks positive attributes in people or situations, he or she will be more likely to find them.

Participant 003: “Cynthia”, age 59 at the time of interview, 3 months post-TKR.

The situation Cynthia described was reaching a physical and emotional breaking point in the early days of her recovery at home due to unmanaged pain, loss of sleep, and appetite. Her Extra Mural physiotherapist suggested a walk to the corner of her street, a few houses from her home. She stated that despite some initial misgivings, she was able to walk the distance and the feeling of success that ensued released her from her cycle of negativity. The elation of the accomplishment recalibrated Cynthia’s perception of her recovery. Cynthia had high praise for the care she received from Extra Mural physiotherapy but ultimately felt she was under-challenged. She said the hospital physiotherapy program would have been more beneficial to her but it had been impossible for her to attend due to transportation and care issues with her spouse.

Cynthia’s hospital stay and recovery at home were problematic due to pain medication and pain management issues. She discussed in detail two medication issues that occurred in hospital. The first was an adverse reaction to medication given while she was in PACU, which she felt had delayed her early recovery. Cynthia believed the care team did not pay adequate attention to her health record, which detailed an elevated risk of medication interactions. The second issue was a serious medication error. She was given, but had not ingested, a dose of medication intended for another patient. Despite assurances by two members of the care team that the dose was correct, Cynthia resisted taking it. She felt her hyper vigilance prevented a more serious consequence. For Cynthia, the error was exacerbated by the fact that the person who gave her the

medication neither acknowledged it, nor apologized. Issues with medication continued at home. Fear of dependency led her to prolong the period between taking her scheduled medication, which she ultimately realized had been detrimental to her recovery.

In her early follow-up appointments, words of encouragement from her surgeon that she was progressing well had minimal effect because ongoing pain and lack of sleep reinforced her negative feelings. Both pre- and post-surgery Cynthia said she lacked the requisite information about the procedure and the outcome. She often referenced her previous surgeries and hospitalizations to make sense of her TKR experience. She was critical of herself for not being a better advocate for herself and seeking more information from the surgeon. She felt this began with her not being prepared for the possibility of surgery at her initial referral appointment. She described wishing for a TKR recovery handbook because she felt ill prepared for what to expect. Cynthia said she would have appreciated an information session with her surgeon a few weeks before her surgery so he could explain the implant, the healing process, and details on long-term outcomes. She stated she was currently on the wait list for a TKR on her other knee and her decision to undergo it was not made easily as she continued to have concerns about having a similar post-operative experience.

Participant 004: “Alan”, age 54 at the time of interview, 3 months post-TKR.

Alan said he was not able to cite a specific situation or event to describe his TKR recovery. Throughout the interview he recalled a back surgery he had over 25 years earlier as the frame of reference for his current recovery.

Pre- and post-operatively, Alan described relying heavily on online forums of TKR patients to obtain information about what to expect during his recovery. These sites

revealed to Alan the heterogeneous nature of TKR outcomes, and reinforced that every patient has a unique experience. He also observed and spoke with others who had TKRs whom he encountered at his local swimming pool and walking track. An older gentleman with whom Alan had a chance encounter predicted from his own experience that by 6 months Alan's knee implant would feel like his own knee. This predication encouraged Alan immensely.

After his discharge from hospital, Alan recounted experiencing an adverse side effect from the pain medication he had been prescribed and based on the information obtained online he stopped the medication completely. He occasionally relied on an over-the-counter analgesia as a sleep aid. He described having serious concerns about dependency, which stemmed from an adverse experience he had with pain medication with his previous back surgery.

Alan said the early days of his recovery were more painful than he anticipated but after a few weeks the pain abated and became a manageable discomfort. At the time of the interview Alan described his knee as more stiff than painful with numbness on the side of the leg. Alan said he was far less worried about his current recovery than he had been with his back surgery because he now had a frame of reference for the recovery process. While he acknowledged his knee was different from his back, he said he continually reminded himself that all healing takes time.

The major concern Alan discussed was the longevity and durability of the knee implant especially as he had been an active golfer. He had researched the probability of loosening of the implant and this was a source of worry for him. Alan said he was

diligent with maintaining his physiotherapy regime and cited a positive outlook and getting out of doors as essential for a problem-free recovery.

Although he felt he had been progressing well from week to week, Alan reported at about eight weeks post-TKR he felt his progress seemed to halt. He recalled the negative affect he felt as the results of a combination of an inability to get outside because of inclement weather, and the sense that his recovery was slower than anticipated which turned into impatience with his progress overall. The 'down period' he described lasted for about a week. His solution was to get out and walk more, and he sought the company of others who had similar experiences. For Alan, his recovery was a series of small progressions that constituted his total healing journey, which are summarized as follows:

Referencing previous surgery: On a number of occasions Alan used the back surgery he had undergone previously as a reference for his TKR. He described the two procedures as similar in complexity, recovery time, and bodily sensation but slightly different in pain experience. When considering the course of his recovery, he said he was prepared for an extended period of healing. He believed his recovery was progressing well. He reiterated that his previous back surgery allowed him to envision what the knee replacement recovery would entail. When he had his back surgery he said he had no frame of reference for his recovery and recalled having more worries about his progress than with his TKR. He noted that he had his back surgery in October and returned to outdoor work about five months later but did not return to sporting activities for 12 to 18 months. With his knee replacement he said he was less anxious and more mindful that time is a factor in the healing process.

Pain: Alan stated his post-operative pain persisted for about 2 to 3 weeks then subsided into a different pain sensation, which he described as more like stiffness in the knee and numbness on the side of his leg below the knee. He recalled similar sensations such as stiffness and numbness after his back surgery so he felt this was normal. He said the pain he experienced at the time of the interview was a different sort of pain than the pre- and post-operative pain, which he described more as a sensation than as pain. He said that he was taking a long view, as he was 3 months into his recovery, he felt that around seven or eight months after the surgery would be a better determination of his outcome. He stated that he currently experienced no pain at night.

Exercise: Alan said he was progressing as well as could be expected. His exercise regime at the time of the interview consisted of riding the stationary bike for 15 minutes and completing his physiotherapy exercises. He described the knee becoming stiff after exercise but he understood it was part of the recovery process. He stated that he took a disciplined approach to his exercises and monitored his progress carefully. He believed it was imperative to do one's exercises and to be patient with the healing process. The Extra Mural physiotherapist had visited him approximately six times and then pronounced him able to carry on by himself. Alan stated that he dutifully completed his series of exercises three times per day. In the early stages of his recovery, he used the local swimming pool for rehabilitation. At the pool, he encountered others who had knee replacements and similar to the experiences he read online, he met people with both positive and negative outcomes. After observing these people in person, Alan believed he could discern those who had been more diligent with physiotherapy and those who had not. Alan reiterated that it was important to be disciplined with the physiotherapy exercises and to maintain

an optimistic perspective about the recovery. Alan added that getting outdoors contributed to a positive mental outlook, which aided recovery.

Sources of information: Alan reported seeking information on the Internet, in particular online forums where TKR recipients shared their questions, concerns, and experiences. These sites revealed to Alan the heterogeneous nature of the TKR outcome, and reinforced that every patient has a unique experience. In response to whether he was able to obtain the information he needed, he explained that his wife was employed at his local hospital and he was familiar with a few of the doctors so he felt he had access to information, and he was also comfortable with the information he accessed online. Recalling the experiences he read online, for some the recovery period was difficult and protracted while for others it was brief. He noted some people returned to work within 8 to 12 weeks.

Alan reported he also had the opportunity to share information with people he met locally. He met a man at the local indoor walking track who had a knee replacement and although he still had some difficulty ambulating due to other conditions with his limbs, the man's story was very encouraging. From his own experience the man predicted that at 6 months post-TKR Alan would feel the knee was his own, not a prosthetic knee. Alan said he found this reassuring and that it gave him a renewed and more positive perspective on his own progress. Alan said he was fortunate to have met the man at that time as the information came when he really needed it.

Concerns: Alan described his TKR recovery as an extended journey. He stated that he had decided to have the TKR so he could maintain his current level of activity, which included his favourite hobby, golf. However, he expressed a major concern about the

long-term durability of the knee prosthesis especially because he was a golfer. He pondered the possibility of the implant loosening over time from the repeated force of the rotation of his knee during his golf swing. He said he had investigated this concern through online sources and had read that up to 2% of knee implants loosen, which worried him.

Follow-up with the surgeon: Alan reported that at the time of the interview he had two follow-up visits with the surgeon and had x-rays taken at both visits. He said the surgeon was pleased with his progress. This was encouraging to Alan as it indicated his recovery was progressing well. He noted the flexion of his knee was 125 degrees and he was able to completely straighten his leg. Along with these objective indicators, Alan appreciated the validation from the surgeon. Alan described his most recent visit with the surgeon 1 week prior to the interview in which they discussed Alan's return to golf. The surgeon cautioned he should begin with simple activities such as chipping and putting, and recommended the use of a golf cart at first. Alan noted he had read similar advice online.

Medication: Alan's experience with pain medication was brief because he said he experienced laboured breathing, which he investigated on the Internet and found that this might be a side effect of the medication. He discontinued the medication entirely and relied instead on an over the counter analgesia. Alan stated that he mainly took this medication at night when he experienced difficulty sleeping. He noted his knee was very sensitive to anything that came in contact with it, which at times made sleep elusive. The medication was used less as an analgesic and more as a sleep aid he said. Referencing his prior back surgery, Alan said the knee was not more painful than his back but he had

relied more on opioids for his back and decided to manage without them for his knee. He noted that the pain from physiotherapy was at times severe but he was able to use rest and ice to cope with it. He acknowledged that while some patients may choose to use opioids, he felt it was not the best choice for him.

Recovery: Alan's recovery from his TKR was slightly more difficult during the first 2 to 3 weeks than what he had read about in online forums. He reported the pain was more severe than he had anticipated but that was to be expected from this type of surgery. Before the surgery he said he did not speculate what his progress might be. Six weeks prior to the interview, he said he was not able to climb the stairs or put weight on his operated limb because of the pain. Now at 3 months post-TKR, he reported that climbing the stairs and weight bearing were not an issue.

Although he felt he had been progressing well from week to week, he reported experiencing a period of time at about eight weeks after his surgery when he felt his progress seemed to halt. He attributed some of his negative affect to a combination of factors: the inability to get outside because of inclement weather, and feeling that the recovery was slower than he had anticipated which turned into impatience with the progress he had made to date. He said this lasted for about a week and he was able to alleviate it by getting out and walking more despite the cold. An acquaintance asked Alan for advice on what to expect during recovery from TKR. Alan recommended that he be prepared for 2 to 3 weeks of post-operative pain, and he stressed the importance of completing the physiotherapy exercises even though the pain might be intense.

Other comments: Alan reported that for him the optimum time for surgery would be in the summer when there is a greater opportunity to get out of doors during the early

days of the recovery in order to enjoy the restorative effects of sunlight and fresh air. Alan said because he was a golfer he did not wish to have surgery in the summer but if he were not a golfer, the summer would be his choice for surgery as he believed there would be less probability of a 'down period' in the summer time. He said he experienced the same sort of thing recovering from his back surgery, which he had in the fall as well.

This concludes the details of the patient interviews. The next step in the Giorgi method was identifying the general themes from the participants' interviews.

General structural constituents. Eight general structural constituents (GSC) or themes were identified and are presented below using the participants' own words to more fully elucidate each theme. Some quotations were edited for length but the original meanings were not altered.

GSC (Theme) 1: The influence of others on participants' views of themselves as patients. The surgeon and members of the care team contributed to how participants viewed themselves as patients in recovery. In some cases, small observations or comments had profound impacts. For Alan, his follow-up visits with the surgeon served to validate his progress, "*... kind of a reassurance, seeing he (the surgeon) said everything looks good, everything is on pace, flexion in my leg is at 125 degrees and it straightens out no problem, just to hear him say everything is on the right path, because he'll know.*" In contrast, Cynthia described the surgeon offering encouragement which she had difficulty accepting, "*... even when I would go for my first check up and my second check-up, he was constantly saying, 'you're too hard on yourself, look at your flexibility, that's what you have to go by' but at that point I was still in pain!*" Brenda recalled a comment from her nurse when discharged from hospital, "She said, '*You're the*

only patient I ever had who never rang the buzzer once in the time you were there'... so I guess I didn't need it, I'm not proud, I just didn't need it." This seemed to reinforce the role of self-efficacy in her recovery. Conversely, Andrea also rarely called on the care team while she was in hospital but instead of feeling empowered, she felt neglected, *"I would look at that clock and it would be four hours and I hadn't seen anybody... I wasn't going to ring for somebody to bring me ice water, I was very careful not to annoy busy people but if I hadn't had some medical knowledge, I think I would have felt somewhat abandoned and certainly confused, who exactly is looking after me?"*

GSC (Theme) 2: Material and emotional support from others. Support and encouragement from family, friends, and others who have experienced TKR is important. Cynthia described her husband's response to her nausea from pain medication, *"I remember one day him giving me a broth soup because he kept saying, 'You have got to get something in your stomach'. I could handle my black tea that was about the extent of it and then he made a broth and I thought, 'God bless your heart, you've been in the kitchen making this from scratch for me, I'm going to get this down if it kills me' and it just about did!"* Andrea recalls an incident while in hospital; *"I'm freezing cold so I got somebody to bring me a blanket. My husband came the next morning, walked in and said, 'This room is freezing!' nobody said, 'let's turn up the thermostat' so I never thought to ask, I just thought it was part of me going into shock or something that I was so cold when really it was just the room that was cold."* Brenda had arranged for assistance from her sister after her discharge from hospital but found it unnecessary, *"my sister took a week's vacation, moved in with me ... I discovered I could do my exercises on my own. I needed very little assistance. My sister and I were both surprised, she says 'well, you*

don't really need me for anything'!" Alan received encouragement from a stranger he met at his local walking track, "he said, 'you'll see in 6 months, it's just like you don't even have a replacement, you feel like it's your own knee'. You know that kind of helped me out. It's his story so you get a better outlook on it."

GSC (Theme) 3: Expectations and mental outlook. A positive outlook was highlighted by a few of the participants, Brenda said, *"I think attitude is three quarters of it, if you don't think you are going to get better you probably won't because you are going to find, it's like when you look for the good in people you always find it, if you're looking for the negative you're always going to find it ... if you make the best of the situation instead of looking for the worst usually a lot better results come of it."* Cynthia said, *"I had no idea whatever as far as the (recovery) period, and my expectations because I didn't know how long things should progress after surgery... If somebody had just sat with me and said, 'it's not going to be a quick fix, you know, 4 months, 5 months, even 6 months, you may have a miserable day, it'll be OK', if somebody had just said those words to me, it would have meant all the difference in the world."* Andrea had bilateral knee osteoarthritis, her other knee would be replaced in the near future which was prominent in her mind, *"Truly I don't look forward to going through that initial post-op period again, at least now I know what the pain is going to be like so I can build that into my recovery"*. Alan looked forward to resuming desired activities but had some concerns, *"I look in the long term because I'm so happy to have it done because I just want to keep going and I want to golf in the summer, but I just worry, is anything bad going to happen to it when I golf? Is it going to loosen up?"*

GSC (Theme) 4: Pain, fatigue, and disrupted sleep. Post-operative pain was predominant for most participants especially when it affected sleep. Andrea who was at 6 weeks post-TKR said, *“The pain would still wake me up or I couldn’t get to sleep, it was night time pain that I still couldn’t manage, in the day time I could pretty much manage it with either heat or ice or elevation but night time I was constantly trying to reposition myself.”* Cynthia also described being unprepared for the pain and the concomitant disrupted sleep, *“I was just deadbeat tired, exhausted because I couldn’t sleep at all, every time I moved in the bed it was just like daggers.”* Alan reported a similar experience, *“I thought the pain was a little more intense at times than I really thought it was going to be... night was the hardest time to get some sleep, because my knee was very sensitive... if you touch something on it, it’s real sensitive.”* Brenda did not mention specific issues with pain or sleep but recalled how the pain medication she had taken for her knee masked pain in other parts of her body, *“...I was on pain killers the first 5 weeks. I had a few left for the fifth week, so in reality I had a false belief that I was back to normal a lot sooner than I actually was because when I stopped taking the pain killers, reality is, ‘oh, my shoulder is bothering me again, oh, my feet are bothering me again’... they seemed to be predominant over the knee.”*

GSC (Theme) 5: Pain medication and concerns about dependency. The topic of pain medication and dependency was another prevalent issue for participants. As Brenda noted, *“I’ve been relatively medication free most of my life, I’ve never taken anything unless I needed to... I think the earlier you start the more you become dependent and I don’t want to become dependent on them.”* Alan echoed Brenda’s concerns, *“it’s not more painful than my back surgery was and I kind of got kind of tied up into pain killers*

and I didn't want to do that again". Cynthia reported having a similar resistance to pain medication, "I think if I'd had a better picture of it, I wouldn't have been as hard on myself, therefore the recovery wouldn't have been as difficult, I wouldn't have fought taking pain medication". Andrea made her own discovery about how best to schedule her pain medication to optimize her physiotherapy, "if you exercise that's going to make the pain worse, because it's going to make the swelling worse. So you have to kind of time that to do your exercise and do it close to when your pain medication is due. So I was able to figure that out."

GSC (Theme) 6: Using medical history as a frame of reference. Each participant used their own medical history, past hospitalizations, and surgeries to provide context for the experience of recovering from TKR. Cynthia contrasted her experience with a previous surgery, *"it's not a quick fix, it's not like an appendectomy, you go in with pain, you wake up, the first few days are rough but you keep going and you know, then 2 weeks you are kind of half human again, it's not that fast a process... I think with having a knee replacement, having something foreign placed into your body, I've had multiple surgeries, I'm scarred from head to toe, a bowel resection was never as difficult as this surgery."* Whereas, Alan found similarities with his previous back surgery, *"I knew what was going to take place because I had the back opened up too and cut ligaments and stuff like that so I knew the healing process was going to take time."* Andrea compared her post-operative pain with childbirth, *"What's the worse type of pain you've ever had? Well, probably when you've had your baby. Well, it's not that type of pain, at all. I did not find it to be that type of pain at all... having a baby, you had your contractions and then it was over with, you had a lovely baby."* Brenda equated her recovery with

regaining something that had been lost, *“I’ve lost (some of my) hearing, I’ll never get that back so if I can get my mobility back and stay mobile... I’ve got to be on the move and I don’t want to be constrained or restricted and that’s my nature.”*

GSC (Theme) 7: Periods of uncertainty. Cynthia recalled an incident in the early weeks of her recovery, *“I consider myself a glass half full type of personality but what I was seeing made me, in the last couple of days, very gloom and doom, when am I going to reach that turnaround?”* Alan also had a period of doubt, *“I felt a little stuck, a little stalled maybe. That was probably about a month and a half... maybe because of just sitting around and the weather is not good, and you get a little down and, you probably want it to go faster... I just felt like it wasn’t progressing like I thought, as fast as I wanted it to be.”* Andrea did not speak of uncertainty, which may be due to her being the most recent from surgery, whereas Brenda expressed surprise with the amount of time she would be away from her job, *“I was shocked, when he (the surgeon) filled out the form and gave it to me for release off work for 12 weeks, I never would have guessed I’d be off work for 12 weeks, there was no way to mentally prepare for that!”*

GSC (Theme) 8: Information from others/comparing self with others. Alan found sources of information online and from other people, *“some of them (online forums) had some bad stories, they were into 9 months and still not getting the bend that they want and they were still stiff all the time, there were other stories where 3 months in or 2 months in they’re back to work but I realize that everybody’s different. I met people that had knee replacements and you know one lady said, well she’s an old lady, and she said, ‘it’s over a year now and it’s still not...’ but just by looking you can tell she never did the work!”* Brenda also commented similarly, *“I have a friend who had hers done and she*

just was not a successful candidate in my mind, just to listen to her talk. I don't believe she's done her exercises either, I don't know that for sure but I suspect that and I don't think she had the healing because of it and so she was pretty negative about it all, and I'm not going to allow that to happen to me". Cynthia said, "I remember about a month in thinking, 'oh, when am I satisfied with seeing the successes of it?' I phoned a family friend, she was a month ahead of me that was a real eye opener... She reassured me, 'you have to pace it, truthfully 4, 5, 6 months in, you may have a couple of bad days'... there's no quick fix and truthfully that's just it". Andrea neither compared herself with others nor sought information from others, instead she envisioned a knee coach, "it would be nice to hire a coach, who would say, 'I can see that you're in distress, if you are going to get your three times of exercise in, right now wouldn't be the time to do that', so there's quite a schedule that needs to be worked out when you first come home. As to, when you need heat, when you need ice, when you need your pain medication, when you need to rest".

General structural description. The eight general structural constituents (themes) listed above and the situated structural descriptions written for each of the four participants were used to craft the following general structural description, which is a composite of TKR recovery of the four participants in this study: For patients recovering from TKR, the experience can be described as a series of interrelated events shaped by self and others. The surgeon and care team play explicit and implicit roles in how these individuals view themselves as patients pre- and post-operatively. As recovery continues from hospital to home, patients with spouses and/or family members benefit from this valuable resource not only for assistance with activities of daily living but also for support and encouragement. Post-operative expectations and mental outlook determine

how patients manage pain, physiotherapy, and the after-effects of surgery such as fatigue and disrupted sleep. Prominent in their minds is balancing the need for pain medication with concerns about dependency. This influences how patients manage and ultimately adhere to their prescribed medication. Patients use their own medical history to make sense of the current state of their recovery. Doubts about recovery precipitate a short period of uncertainty, which abates as progress is measured in calendar weeks and improved function. The most sought after and trusted source of information for patients is the surgeon but with few scheduled follow-up visits, many seek additional information from other sources, including personal contacts, allied health care professionals, and online informants. The positive and negative experiences of others provide a frame of reference for patients as they envision the long-term outcomes of their TKR.

3.8 Creative Interpretation of the Giorgi Analyses

“I Am Your Knee”

I am your knee. I am bone, ligaments, tendons and cartilage — the source of your pain and the cause of your compromised mobility. Over time, slowly and relentlessly, your quality of life diminished until you had no choice but to replace me. I had to go. The reasons don't really matter, wear and tear over time, gender, genes, the extra weight you and I carried all these years. The decision to have surgery was easy once you saw it on the x-ray. It was all there in black and white, “bone on bone” is what the surgeon said. He showed you on the x-ray where there should be space in the knee joint that indicates healthy cartilage. There is no space, my cartilage is mostly gone... no wonder it hurts. Once you decide to have me replaced, you wait. All the while I continue to fail, unstable and unsteady. Other parts of your body start to hurt because of me. Sometimes when you get out of bed in the morning, you curse me.

You plan and prepare as best you can for the surgery that will happen sometime in the next 9 to 12 months or so, but you don't know for sure until you get the call. You go to

pre-op clinic with the others, take turns meeting with the nurse, physio, and the pharmacist. Your blood is drawn and you have an ECG. You chat with the lady sitting next to you as you wait for the next test or to see the next person. She tells you her story, and you share yours. You compare notes about surgeons. She mentions a neighbour... a relative... a friend... who had their knee done a while ago by Dr. so and so. You have your final x-ray and you are cleared for surgery, but you still have questions. You want to look online and talk to other people who had it done, family and friends, but then you don't want to look online and you don't want to talk to anyone. Everybody is different you tell yourself. You are a little nervous on the day of your surgery, what if it gets cancelled? What if they operate on the wrong knee? The surgeon comes to see you as they prepare you for surgery. Your leg gets marked. He tells you everything looks good.

The surgery goes as expected. Some people wake up nauseous from the anesthesia or have a reaction to the medication. Others have no issues at all. You know how busy the nurses are. You don't want to make extra work but small acts of comfort go a long way. There may be challenges in the first few hours and in the first few days and weeks after surgery. You think about other surgeries you've had. How does this one compare? It helps make sense of it all. You do physio each day, when you are able to do the stairs, you are cleared to go home. You are given a prescription for pain medication; you will begin physiotherapy at the knee clinic. You will have your stitches out. You may find it takes a while to get your medication sorted out. You have to time it right to do your physio. You are nervous about depending on the medication too much but everyone says you need to take it to do the physio. For a while your sleep is disrupted, it's difficult to get comfortable, you don't want anything touching your knee. The pain changes over time. The first few weeks are rough but you get through them. You start to see the signs of improvement; you can stand longer, and walk farther. You still have questions. You talk to other people at physio or friends or family who had their knee replaced. You compare experiences and talk about range of motion. You see other people and you believe you can tell who is doing their physio and who isn't. You see others doing the same to you. You anticipate your follow-up visits with your surgeon; he examines your knee, reviews your x-rays, and tells you everything looks good. There are specific things you want to do. When can you do them? Recovery takes time. You have a few days when you are

really discouraged. Maybe it's the time of year, if the weather was better, or maybe you are just tired. You try and stay positive. One day you do something you hadn't done in a long time and you are surprised. It is a reminder why you decided to have me replaced. You think about how long these new parts will last. You think about how your other knee is holding up. You wonder about doing it all again.

I am your knee — I am bone, ligaments, and tendons, but now I am also metal and plastic. A different knee, but I am still your knee.

3.9 Discussion

The participants in this study are individuals with unique experiences recovering from TKR, yet a number of their descriptions are congruent, such as dealing with post-operative pain, disrupted sleep, and concerns about pain medication. The sum of these experiences is how these patients make sense of their recovery.

The themes identified in this study have some similarities and differences with published research on TKR experiences. The theme that the participants' views of themselves as patients is implicitly and explicitly shaped by others is echoed in a study of patients transitioning home after total joint replacement surgery (Perry, Hudson, & Ardis, 2011). In this study, patients report interactions with care providers in hospital and at follow-up visits that reveal a paternalistic health care model that is "overtly demonstrated by language and experiences, and at other times this theme was inherently conveyed by context" (Perry et al., 2011, p. 919). Patients in Perry et al. (2011) acquiesced and even, "rationalized and then excused the use of this paternalistic model of health care and behaviour by suggesting that the surgeon was a busy person" (p. 920). Two participants in the current study made similar comments about not wanting to 'bother' busy health care providers while they were in hospital.

The participants also report comparable experiences relying on family and close others for care and support after being discharged from hospital, similar to Perry et al. (2011), “this support was perceived to be a positive and necessary aspect of their continuing rehabilitation” (p. 918). However, Perry et al. (2011) also report a dynamic not mentioned by participants in this study, that of the occasional tension that arose between the care provider and receiver when preexisting roles had to be adjusted during the recovery period. The salience of this issue in Perry et al. (2011) may be attributed to the use of more semi-structured interview questions focused on hospital discharge and the first few days at home. In the present study, the use of a broader opening question allowed participants to decide and speak about the aspect of recovery that was most relevant to them. Another study investigating patients’ and spouses’ needs after total joint replacement highlights the importance of spousal support for the transition from hospital to recovery at home. Patients and spouses report feeling unprepared for what the recovery period entails (Showalter, Burger, & Salyer, 2000). Participants in the current study observed this as well. For example, Brenda described being over prepared and pleasantly surprised with her recovery, whereas Cynthia felt underprepared and experienced early frustrations and disappointment with her recovery.

Understanding patient expectations is an important theme in much of the research on patient post-operative experiences, and in the larger orthopaedic literature (Mahomed et al., 2002; Mannion et al., 2009; Nilsson, Toksvig-Larsen, & Roos, 2009; Noble et al., 2006). Showalter et al. (2000) report in their study that for both patients and spouses expectations vary from realistic to unrealistic and family and friends who had previously undergone total joint replacement surgery often influence expectation formation. Other

studies describe similar variability in expectations (Gustafsson, Ponzer, Heikkilä, & Ekman, 2007; Marcinkowski et al., 2005; Perry et al., 2011). The implications for orthopaedic care and practice is the need for “individualizing information given to patients about their recovery, specifically information about possible variations in ability to resume activities and resolution of pain” (Showalter et al., 2000, p. 57). As Marcinkowski et al. (2005) rightfully note, age-related differences in recovery might influence how patients establish expectations for recovery. One of the participants in the current study, Brenda, made a number of references to age-related differences in surgeon-patient communication, comparing and contrasting her experience with her father’s.

Pain, fatigue, and disrupted sleep are often unavoidable but common short-term outcomes after TKR (Akyol, Karayurt, & Salmond, 2009; Gustafsson et al., 2007; Jacobson et al., 2008, van Egmond, Verburg, Vehmeijer, & Mathussen, 2015). In the current study, fatigue and disrupted sleep seemed to take most participants by surprise. In terms of post-operative pain overall, participants had an understanding there would be post-operative pain, but many were unsure about the duration and severity. Similar findings are reported in other studies (Jacobson et al., 2008; Perry et al., 2011; Perry et al., 2012; Showalter et al., 2000), “in particular, the amount of pain felt at night was unexpected. Pain was interpreted to mean doing too much in the day, having done something silly, such as twisting awkwardly, or that the new joint or bone was not healing. Regardless of cause, pain made the participants fearful.” (Perry et al., 2011, p. 919). Although not stated as fear, participants in the current study did express feelings of uncertainty at times about how much pain was too much pain.

Participants had much to say about pain medication. The most clearly articulated concerns were about side effects and dependency. This is similar to a qualitative study in which participants “altered their medication regimes in response to several factors including adverse effects, risks of addiction, pain severity, and medication advice” (Bremner, Webster, Katz, Watt-Watson, & McCartney, 2012, p. 149). As noted above, there is limited published research on patients’ post-TKR experiences in general, and even less when looking specifically at pain medication adherence (Bremner et al., 2012). Taken together, the findings from the current study and Bremner et al. (2012) indicate that more patient education is needed to allay patients’ concerns about dependency and addiction to ensure that pain is properly managed during recovery, and this education should begin prior to surgery.

Overall, the research presented in this qualitative study suggests the need for more targeted information and guidance from surgeons during TKR recovery and even before surgery. This was a finding in research into the education needs of patients in the perioperative period for total joint replacement surgery (Soever et al., 2010). While some of the education topics might be addressed by other members of the care team across the care continuum, some are specific to the surgeon (Soever et al., 2010). Education can be optimized through quality surgeon-patient communication. In fact, one study identified “the dimension of experience most strongly associated with assessments of effectiveness is communication and trust in the doctors. This could be explained by good communication instilling a more realistic expectation of the likely outcome, which in turn will increase the likelihood of patients regarding their outcome as satisfactory” (Black, Varaganum, & Hutchings, 2014). Education should take into account individual patient

expectations and reinforce the notion that “the length of time it takes to recover from surgery differs for individuals and may range from weeks to months” (Marcinkowski et al., 2005, p. 208). In sum, this study highlights the need to take an approach that is specific to the individual patient throughout the perioperative period to ensure expectations are well managed and satisfaction is achieved within the context of what is possible for the outcome given other mitigating factors and influences for each patient.

3.10 Significance of the Qualitative Study

The significance of this qualitative study is that it contributes much needed insight into patient experiences with TKR recovery between 6 weeks up to and beyond 3 months. The richness of the data obtained is due in part to the broad scope of the interview question, which allowed participants to self-select and speak about what was most important to them. It is also significant that among these four patients who varied in age, sex, and life experience, similar themes emerged from their recovery narratives. As noted previously, the expectation of an equal-status mixed methods study would be that each study would be of sufficient merit to exist as a stand-alone study. To that end, a short report of this qualitative study was published in *Musculoskeletal Care* in 2016 (Gautreau, Aquino-Russell, Gould, & Forsythe, 2016).

3.11 Limitations of the Qualitative Study

A limitation of the Giorgi method (and by association, all descriptive and phenomenological methods) is identified by Creswell (2013) and Giorgi himself (Giorgi, 2008), which is that a sufficient understanding of the broader philosophical assumptions of Husserlian phenomenology is required. Without it, in the case of the Giorgi method, the systematic steps prescribed by Giorgi may be adapted or varied in such a way as to

produce findings that are not “sound from either a research perspective or phenomenologically” (Giorgi, 2008, p. 34). To address this issue, a detailed and in depth review of Giorgi’s publications, the steps of the Giorgi (2009) method, and how generally the Giorgi method is used in health research was a key component of the literature review in preparation for the qualitative study.

Another limitation that is often ascribed to qualitative studies is the use of purposeful sampling for participant selection. Although generalizability is not the goal in qualitative research, it is important that participants are representative of the patient population of interest. The average age in this study was 58.5 years, whereas the average age for TKR in Canada in 2014-2015 was 67 years according to the Canadian Joint Replacement Registry (CIHI, 2017). This age difference may not be an issue because the experiences described by the participants in this study are similar to issues and concerns identified in the TKR literature across multiple age groups (Perry et al., 2012). Furthermore, the experiences of this age group may inform future research because an ever-increasing number of adults age 45 to 54 are having knee replacements. Indeed, CJRR data shows that TKR increased over 280% in 10 years from 2003-2004 to 2013-2014 among patients age 45-54 (CIHI, 2015). More information about recovery experiences in this age group may help surgeons and other health care professionals adapt to the education needs of a patient population that may still be in the workforce. Finally, another limitation in the present study is that the interviewer is employed as an orthopaedic researcher in the same hospital as the surgeon who performed the surgeries in question, so it is possible that participants may not have been as candid as they might have been with an unaffiliated interviewer.

3.12 Conclusion

The participants in this study had experiences recovering from TKR that were both unique to the individual yet consistent across the participants. This research is part of a larger study focused on gaining a more complete understanding of the experiences of patients undergoing TKR in order to improve satisfaction with the outcome. Helping patients find better ways to manage expectations is vital to increasing satisfaction with TKR. Nonetheless, while the notion of some universal patient experiences with TKR is useful, surgeons and health care providers should keep in mind that every patient is unique in their recovery. Ultimately, qualitative studies such as this allow us to acknowledge individual experiences, yet explore the core similarities across patients' experiences with TKR.

4.0 CHECKLIST DEVELOPMENT

4.1 Introduction

What is a checklist? Broadly stated, it is “a list of action items, tasks or behaviours arranged in a consistent manner, which allows the evaluator to record the presence or absence of the individual items listed” (Hales et al., 2008, p. 24). As outlined in the literature review, section 2.6, Hales et al. (2008) identified seven steps to developing medical checklists, which include determining the goal of the checklist, identifying its context, users, content, structure, design, and utility (Hales et al., 2008). This chapter describes how the Hales et al. (2008) criteria was used to develop the Orthopaedic Surgery Outcome Communication Checklist (the checklist), which was then used as the intervention in the quantitative study reported in Chapter 5.

The main goal of the checklist developed here was to assist orthopaedic surgeons more effectively communicate with their patients to help them manage, set (or re-set) post-operative outcome expectations so that greater TKR satisfaction is achieved. The context for the use of the checklist is a hospital outpatient orthopaedic clinic where patients recovering from TKR return for follow-up x-rays and progress assessment by their surgeon. The timeline for the use of the checklist in this study was 6 months although it should be noted that the checklist could conceivably be used from post-operative day 1 up to and beyond 6 months. The intended users of the checklist were the surgeons. The checklist items were communication prompts for surgeons to discuss outcomes and expectations with patients during post-operative follow-up visits. The remaining items from the Hales et al. (2008) criteria, content, structure, design, and utility are discussed in the following sections.

4.2 Checklist Development Process

The process for identifying potential items for the checklist began with reviewing the results from the qualitative study reported in Chapter 3. The interviews with the four participants in this study were analyzed using a descriptive phenomenological method described earlier and resulted in eight themes: 1) Participants' view of self as patient was influenced by others; 2) The importance of material and emotional support from others; 3) Expectations and mental outlook; 4) Pain, fatigue, and disrupted sleep; 5) Issues with pain medication/dependency concerns; 6) Medical history as a frame of reference; 7) Periods of uncertainty; and 8) Information from others/comparing self to others. The actionable items from these themes such as 'pain, fatigue, and disrupted sleep' and 'issues with pain medication/dependency concerns' became the foundation items of the checklist. A review of the literature on patient expectations and satisfaction after TKR identified additional items that were integrated with these foundational items.

4.3 Directed Content Analysis

Directed content analysis (DCA) is one of three approaches that falls under the overarching qualitative research method known as content analysis (Hsieh & Shannon, 2005). Content analysis is defined as "a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (Hsieh & Shannon, 2005, p. 1278). The application of DCA in the present study involved developing a set of exemplar words and phrases that indicated patients' concerns or issues about their recovery, such as "I was concerned, worried" or "I did not know". The researcher (S.G.) and co-supervisor (O. G.) collaborated on the development of the list of exemplar words and phrases that pertained

to recovery from TKR. The final list comprised 13 words or phrases: I wish I had known; If I only had known; I found/I did not find; I was surprised that; I did not realize; I did not know; I had no idea; I wondered; I expected/did not expect; I thought/I did not think; Any reference to deciding/decision; I was worried/concerned/upset, and I feel/felt.

To confirm that data saturation had been achieved after the first four interviews and to identify new themes or potential checklist items, an additional four participants were interviewed using the same interview questions used in the descriptive phenomenological method. Data saturation “relates to the degree to which new data repeat what was expressed in previous data” (Saunders et al., 2017, p. 5)

A medical transcriptionist was engaged to transcribe the second set of interviews, which were checked for accuracy and then were combined with the Giorgi method interviews for a total of eight participant interviews. The first step of DCA was to copy each participant’s full transcript into an Excel file to be reviewed for the pre-identified exemplar words and phrases. Any phrase that matched the exemplar word or phrase was added to a column created for potential checklist items in the Excel file and was also cross-referenced with the themes obtained in the descriptive phenomenological analysis. Items were further classified as potential checklist items – yes, no, and maybe. Each was then reviewed and discussed iteratively with co-supervisor (O. G.) until the final list of checklist topics and items was complete.

4.4 Results

Participants. Five women and three men comprised the final sample. The mean age of the participants was 61.6 years and they were an average of 11.8 weeks post-TKR.

Table 2 shows the demographic information and type of analysis by the alphabetically ordered participant pseudonyms.

Table 2

Participant Characteristics, Directed Content Analysis

Study ID #	Participant pseudonym	Age	Sex	Post-TKR week	Marital status	Employment status	Analysis method
001	Andrea	66	F	6	Ma	R	G + DCA
002	Brenda	55	F	7	S	FT	G + DCA
003	Cynthia	59	F	14	Ma	R	G + DCA
004	Alan	54	M	12	Ma	FT	G + DCA
005	Brian	55	M	7	Ma	R	DCA
006	Calvin	65	M	24	Ma	R	DCA
007	Donna	62	F	8	S	FT	DCA
008	Ella	77	F	16	W	R	DCA

Note. TKR = total knee replacement; F = female. M = male. Ma = married. S = single. W = widowed. R = retired. FT = employed full time. G = Giorgi. DCA = directed content analysis.

To illustrate the steps taken in the DCA analyses, an abridged version of the format of the Excel file which catalogued the transcripts from each participant and how the relevant comments were processed is shown as an example in Table 3 using excerpts from five of the eight participants. The table shows the participant's pseudonym, the participants' verbatim comments, the DCA word/phrase, and a yes or no as to whether the item should be included in the checklist with the reason why or why not.

Table 3

Example of Directed Content Analysis

Name	Participants' words	DCA word/phrase	Checklist (Y/N)?
Ella	In the beginning I was not expecting it to be as long a recovery...I found it difficult sleeping, I couldn't sleep in bed for two months.	I did not expect; I found (it difficult)	Y – recovery expectations/ issues with sleep
Donna	I did have the worry (about how the surgery itself would go) but that was because I heard stories from other people that theirs didn't go well.	I was worried/ concerned/upset	N – worry related to procedure not recovery
Calvin	I am thinking now like I had gone up a ladder and went to climb on to the roof and I am nervous transferring from the ladder to the roof and I'm wondering then if the knee will hold up or not.	I was worried/ concerned/upset	Y – address concerns about knee stability; limitations on activities
Brian	I know for a fact that if you don't do them (physiotherapy exercises), you're going to have problems.	I know/did not know	Y – importance of physiotherapy
Andrea	I've no idea what breakthrough pain is supposed to look or feel like... I was depending on the nurses or the staff to help me make those decisions.	I had no idea	N – breakthrough pain related to management of pain in hospital
Alan	You know you get a little down and, you just probably want it to go faster and ... I just felt like it wasn't progressing like I thought.	I feel/I felt	Y – mental outlook

Note. DCA = directed content analysis.

The final checklist items were distributed into four main categories, pain management, medication, physiotherapy, and general. Within each category were four to

six items the surgeon would address with patients during follow-up visits. The checklist is found in Appendix IV. The categories and their corresponding items are as follows:

Pain: What you can expect for pain; Pain at night; Normal post-operative knee pain/sensitivity; Managing pain; Other pain questions/concerns; No pain issues

Medication: Medication side effects; Dependency; Pain management; Other medication questions/concerns; No medication issues.

Physiotherapy: Role of physiotherapy in recovery; Range of motion and straight leg raise; Managing physiotherapy pain; Pain medication and non-medicinal treatments; Other physio questions/concerns.

General: What you can expect for recovery; Return to activities (e.g. driving, work, sports); Concern about falls and injuries; Mental attitude; Other general questions/concerns.

The category format allowed the structure of the checklist to be presented as four distinct but interconnected units, which allowed for a design approach that was visually easy to navigate, had ample white space, used an appropriate font size, and had all of the content on one page. The reverse of the checklist was a reference guide for the surgeons using the checklist.

Hales et al. (2008) made explicit that the two main criteria for the usability of the checklist was that it “not be so onerous or time consuming as to notably interfere with administration of patient care... should encompass checkpoints of major importance, while still providing clinicians with the freedom to use their own judgment” (p. 25). This is the reason for including the item, “other ____ questions/concerns” at the end of each category to provide patients with the opportunity to have any additional issues addressed.

4.5 Expert Panel Review and Pilot Testing

Hales et al. (2008) recommended that checklists be pilot-tested to ensure that the content of the checklist and the time needed to complete it “is feasible, practical and does not interfere with time-to-delivery of appropriate and safe patient care” (Hales et al., 2008, p. 28). Prior to the pilot test, an expert panel of four orthopaedic surgeon-researchers was invited to comment on the content, design, and structure of the checklist to determine how a larger group of surgeons would perceive the utility of the checklist. Two of the surgeons were from Halifax, NS, one was from Winnipeg, MB, and the fourth was the surgeon who was a member of the dissertation committee (M. F.). All comments and recommendations were considered and any amendments to the checklist were made iteratively as each reviewer weighed in. Surgeon and dissertation committee member (M.F.) then tested the mechanics of the checklist in a few clinic visits. After each use, comments and recommendations were provided for additional amendments. Upon completion of this stage, the checklist was ready for use in the quantitative phase of the mixed methods study with M.F. and four other surgeons in the department of orthopaedic surgery who perform total knee replacements at The Moncton Hospital.

5.0 QUANTITATIVE STUDY

5.1 Introduction

Satisfaction with TKR is correlated with the fulfillment of patient expectations (Bourne et al., 2010) and an important aspect of this involves surgeon-patient communication. Quality communication contributes significantly to patient satisfaction (Morris et al., 2013), yet it may be challenging to achieve due to the growing number of patients requiring TKRs and the fee for service structure of the Medicare system in Canada that prioritizes expediency. Thus, it was hypothesized that a tool that improves the quality of time-limited surgeon-patient interactions would have value because it could optimize the surgeon's role in helping patients set (or reset), and manage post-operative expectations that are realistic, achievable, and most importantly, patient-specific.

In the quantitative study of this mixed method research, the Orthopaedic Surgery Outcome Communication Checklist (the checklist) was used as a communication intervention to determine if it contributed to greater TKR satisfaction after 6 months. One group of patients who received the usual standard of care (SoC) communication from their surgeons were asked to rate their satisfaction after they had reached 6 months post-TKR. A second group of patients received the checklist intervention during their post-operative follow-up appointments from 6 weeks up to 6 months and then had their satisfaction measured after they had reached 6 months post-TKR. The two groups' mean satisfaction scores were compared. It was hypothesized that the use of the checklist would contribute to significantly greater patient satisfaction. Exploratory analyses were also carried out to investigate differences between the checklist group and the SoC group on age and sex. A random sample of timed clinic visits was recorded from both groups to determine if there was a significant difference in the duration of follow-up appointments.

The aim of the quantitative study was to test the intervention of the communication checklist to determine if it impacted patient satisfaction after 6 months while not substantially increasing the time surgeons spent with patients in post-operative follow-up visits.

5.2 Research Questions

The main research question of the quantitative study was, “*Does the use of the communication checklist by the surgeon in post-TKR follow-ups from 6 weeks up to 6 months result in significantly greater patient satisfaction after 6 months?*” The secondary research question was, “*Does the use of the checklist add significantly more time to routine follow-up clinic visits?*”

5.3 Methodology

Participants

Females and males, aged 45 years and older, were recruited from a list of chronologic consecutive patients who had a primary TKR at The Moncton Hospital performed by the co-investigator surgeons. There were two groups, the standard of care communication group (SoC), which was the control group, and the communication checklist group, which was the intervention group. Similar to reasons cited by Haynes et al. (2009), the consecutive recruitment of the two groups was necessary because to randomly assign participants simultaneously would likely result in the checklist items leaking into the surgeons’ communication with their patients, a potential confounder.

Sample size. G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) a statistical power analysis program was used to estimate the required sample size for independent *t*-tests comparing the mean differences between the SoC group and the checklist group on

satisfaction. Using a two-tailed non-directional hypothesis, alpha level (α) of .05, a recommended power of .80, and estimating a medium effect size (ES) of 0.5 (Cohen's d), the predicted sample size for each group was 64, for a total of 128 participants. The per-group number of 64 was cross-referenced to a paper by Cohen (1992) and found to be identical with the same parameters applied. Cohen observed that "in research planning, the investigator needs to know the N necessary to attain the desired power for the specified α and hypothesized ES" (Cohen, 1992, p. 156).

Materials

Two informed consent forms were used in the quantitative study; the first was for the SoC participants (Appendix V) and was sent in the survey packet mailed to potential participants, and the second was for the checklist participants (Appendix VI). Since the checklist participants received the checklist as an intervention, the hospital's research ethics board required a different, more specific informed consent form.

Orthopaedic Surgery Outcome Communication Checklist (the 'checklist'). The checklist is a reference sheet the surgeons used as a guide for discussions with the intervention patients about their progress, expectations, and outcomes from 6 weeks up to 6 months after their TKR. The checklist is described in more detail in Chapter 4, section 4.4 and the example is Appendix IV.

Satisfaction questionnaire. The satisfaction questionnaire was adapted and extended from one of the few reportedly reliable and validated satisfaction surveys in the orthopaedic literature (Lau et al., 2012). The four questions that comprised the Self-Administered Patient Satisfaction Scale for Primary Hip and Knee Arthroplasty (SAPS; Mahomed et al., 2011) were combined with eight questions that addressed patient

expectations, aspects of the surgeon's communication ability including the care and concern shown by the surgeon, and the satisfaction with the time the surgeon spent with patients in follow-ups visits.

The Self-Administered Patient Satisfaction Scale (SAPS; Mahomed et al., 2011) has four items, satisfaction with the TKR, satisfaction with the TKR for relieving pain, satisfaction with being able to return to house or yard work, and satisfaction with being able to return to recreational activities the patient enjoys. Psychometric testing with 1,700 hip and knee patients found good convergent validity with other validated pain and function scores and excellent internal consistency reliability. The SAPS is described as “a simple instrument to explore the complex relationships between patient baseline pain, functioning, expectations of surgery, and satisfaction with outcome” (Mahomed et al., 2011, p. 5) and is one of the few TKR satisfaction measures with published reliability and validity data (Lau et al., 2012).

A visual analog scale (VAS) was used as the method of rating the 12 satisfaction items. Using satisfaction with the TKR as an example, the VAS was a 100 millimetre horizontal line with *completely dissatisfied* anchored at one end and *completely satisfied* at the other end. Above the line was written: “Please mark a ‘X’ on the line below that best indicates how satisfied you are with the results of your knee replacement surgery”. To score each response, the same ruler was used to measure from the left in millimetres to where the X had been marked on the line and that number was recorded as the score out of 100. Each VAS score ranged from 0 (completely dissatisfied) to 100 (completely satisfied). VASs are used in orthopaedic research and are an acceptable method of assessing patient reported outcomes according to the 2016 Report of the Patient-Reported

Outcome Measures Working Group of the International Society of Arthroplasty Registries (Rolfson et al., 2016). A review from a 1990 paper suggested that while the VAS has acceptable construct, discriminant, and criterion related validity, some caution should be used in interpreting a mark on a line measured by a ruler as the respondent's intended numerical score (Wewers & Lowe, 1990). Although in a more recent comparison of satisfaction measures using a Likert scale format versus a VAS format, the VAS was shown to be superior to the Likert because it provided continuous data that had more variability, was less susceptible to confounders such as patient age and ceiling effects, and overall showed more reliable results than the Likert scale (Voutilainen, Pitkäaho, Kvist, & Vehviläinen-Julkunen, 2016). See Appendix VII for the satisfaction questionnaire.

Patient information sheet. Included in the mailed survey packet was a form (Appendix VIII) to collect demographic data from participants. The data collected included: age, sex, date of birth, height and weight (to calculate BMI), other medical conditions, occupation/past occupation if retired, current living situation, i.e., living with spouse/partner, or other family members or friends.

Procedure

As part of the larger mixed methods study, ethics approval was obtained from the hospital's research ethics board (REB) and from the affiliated academic institutions of the student and the co-supervisors. Re-approvals were obtained annually from all REBs for the duration of the study.

Participants in the standard of care group (SoC) were identified from a chronologic consecutive list from the hospital's administrative database using the criteria of patients

aged 45 years and older, having had a primary TKR more than 6 months prior by the surgeons participating in the study. These patients received a survey packet in the mail with a postage paid return envelope addressed to the researcher (S.G.). For the SoC patients, recruitment continued until a minimum of 64 questionnaires were returned, which was the per group number identified in the power analysis. The surgeries and recovery periods for the SoC group occurred between May 2014 and June 2016.

While the SoC survey was underway, the checklist was developed, reviewed by the expert panel, and pilot tested. The recruitment of the required 64 checklist participants began once the requisite number of SoC questionnaires was received from each surgeon's patients. To mitigate the possibility of a surgeon confounder, the recruitment of an equal number of patients per surgeon was attempted. The surgeries and recovery periods for the checklist group occurred between September 2016 and August 2017.

To recruit the checklist group, potential participants who met the inclusion criteria were identified from the weekly surgical lists. The surgeons informed applicable patients about the study and introduced the researcher who later explained the study in more detail, answered any questions, and conducted the informed consent meeting. A signed copy of the informed consent form was provided to each participant. Most of the consent meetings occurred while the patient was in hospital after their TKR but a few occurred in the orthopaedic clinic at the first follow-up visit. It was expected that some consented patients might not receive the checklist intervention due to issues that might arise in the clinic or with the patients themselves so a number of patients above the 64 identified in the power analysis were recruited to lessen the impact of a potential loss to follow-up.

Checklist intervention. At each follow-up visit from 6 weeks up to 6 months, the surgeon used the checklist with the participating patients. The surgeon checked off each relevant item as it was reviewed, and made notes in the space provided if needed. There was a place for the surgeon to sign and date indicating the checklist was used. The researcher (S.G.) was in the clinic area for most of the follow-up appointments but was not in the examination room during the patients' follow-up visits.

Survey administration. After 6 months post-TKR, potential participants in the SoC group were mailed a survey packet consisting of four items: (1) an informed consent form with an explanation of the study; (2) the satisfaction VAS questionnaire; (3) the patient information sheet; and (4) an addressed postage paid return envelope. Participants in the checklist group were also mailed a survey packet after 6 months post-TKR with the same items except that in place of the initial consent form, an ongoing consent form was included because they had already been consented 6 months earlier, the ongoing consent form reminded participants that they had consented to take part in the study and that their continued participation was voluntary (see Appendix IX).

Data on complication rates, diagnosis of osteoarthritis versus rheumatoid arthritis, and whether a TKR on the contralateral knee or a bilateral TKR was performed, was collected from the electronic health record for which permission had been obtained on the informed consent forms.

Duration of clinic visits. In order to address the question of whether the checklist increased the amount of time spent in follow-up visits, a random sampling of the duration of clinic visits (recorded in minutes and seconds) was collected during the control period and the checklist intervention period by the researcher (S.G.). The stopwatch application

on the Apple iPhone was used to time the surgeon's visit with each patient from the time the surgeon entered the clinic examination room until he exited. The data recorded included the patient's study identification number, the date and time of the scheduled clinic visit, the surgeon, the post-operative clinic visit (e.g. 6 weeks, 3 months, 6 months), the time the surgeon entered and exited the clinic exam room, and the stopwatch time. The researcher did not interact with the patient or the surgeon during this data collection.

Data analysis. Statistical analyses were conducted with IBM-SPSS software, version 24.0 (IBM SPSS Inc., Chicago, USA). Descriptive statistics were computed for all baseline demographic, clinical, and patient-reported variables of interest. Differences between the SoC group and the checklist group were assessed on demographic variables to determine if there were any significant group differences. Counts and proportions were presented for categorical variables, and means and standard deviations for continuous variables. Differences between the SoC group and the checklist group were assessed with a series of hypothesis tests. Independent *t*-tests were used to examine differences in continuous variables and Chi-square for categorical variables. Exploratory analyses were carried out on the effects of age and sex on satisfaction using a two-way analysis of variance. For all statistical analyses for which a *p*-value was calculated, $p < .05$ was considered significant. An effect size calculator for *t*-test results was used (Ellis, 2009). The effect size operational definitions for Cohen's *d* are small = 0.20; medium = 0.50; and large = 0.80 (Cohen, 1992). For chi-square analyses, effect sizes are *phi* (Φ) or Cramer's *V*, small = 0.10; medium = 0.30; and large = 0.50, and are reported in the SPSS output (Field, 2009).

Patient occupation (if retired, occupation before retirement) reported on the patient information sheet were classified according to the International Standard Classification of Occupations, 2008 (International Labour Organization, 2016), then further coded by the researcher (S.G.) and co-supervisor (O.G.) as either a physically demanding occupation or a non-physically demanding occupation. Comparisons of occupation classifications were carried out using chi-square.

There were 12 items in the satisfaction VAS, of which a number were conceptually similar, e.g. three items related to care and concern by the surgeon and three items assessed satisfaction with the surgeon's communication ability. A series of subscales were developed from the items that were conceptually similar. Five subscales were derived from the original 12 items and are discussed in more detail in the Results. A Cronbach alpha (α) was calculated to measure the internal consistency of each subscale. A Cronbach α between .80 and .89 is considered good and between .90 to .99 is considered excellent (Cronbach & Meehl, 1955).

The Holm-Bonferroni sequential correction (Holm, 1979) was used to adjust the alpha level when undertaking multiple comparisons that could result in an inflated alpha level. The Bonferroni correction is often used but is criticized for being too conservative, making real effects more difficult to detect (Aickin & Gensler, 1996). The Holm-Bonferroni correction is purported to be an excellent alternative, controlling for Type I errors while not unduly increasing the probability of Type II errors (Abdi, 2010). The Holm-Bonferroni correction is straightforward, the calculation starts with .05 as the threshold p value. The p values obtained from the t -tests are ordered from greatest to least significance. For each test, a new criterion value for significance is calculated. If the first

p value is greater than or equal to $\alpha/\#$ of p values (in this case $.05/5 = .01$), the procedure is stopped and no p values are significant. If the first p value is significant, the second p value is compared to $\alpha/(\#-1)$. If the second p value is greater than or equal to $.05/(5-1) = .0125$, the procedure is stopped and no further p values are significant. This approach is applied iteratively until no further p values are significant.

To quantify the measure of association between the use of the checklist and the five measures of satisfaction, the Calculation of Effect Sizes by Lenhard and Lenhard (2016) was used. This online computation application transforms Cohen's d effects sizes "according to Cohen (1988), Rosenthal (1994, S. 239) and Borenstein, Hedges, Higgins, and Rothstein (2009; Transformation of d in Odds Ratios" (Lenhard & Lenhard, 2016). Odds ratios are often reported in the orthopaedic literature so these results were included.

A t -test was used to compare the mean duration of clinic visits in minutes between the SoC and the checklist groups. A minimum of 26 observations per group was required for a two-tailed non-directional hypothesis, large effect size of 0.8, and an α -level of .05 (Cohen, 1992; Faul et al., 2007).

5.4 Results

Response Rates. A total of 149 survey packages were sent to SoC patients, three were returned to sender. Of the remaining 146, 81 were returned for a response rate of 55.5%. Once the checklist phase of the study had begun in the clinic follow-up visits, one surgeon withdrew his participation so the 12 SoC patients of this surgeon who had returned surveys were removed from the data set leaving 69 participants in the SoC group. Two additional patients were dropped from the sample upon discovery that they did not have a primary TKR. The final sample for the SoC group was 67 participants.

As noted above, the checklist group had to be consented before the patients' first follow-up appointment in clinic so the consenting of the checklist group began once the requisite number of SoC surveys for each surgeon had been received. The consenting of checklist patients continued until 80 checklist patients had been consented. In total 74 of these participants were sent survey packets after 6 months post-TKR. Of the six consented participants who were not sent survey packets, three were from the surgeon who withdrew his participation from the study, one patient had a femur fracture on the index knee due to a fall, one was diagnosed with terminal cancer and it was felt that sending a survey packet would be inappropriate, and one had not disclosed having a TKR on the contralateral knee. Sixty-one of the 74 participants returned surveys (response rate 82.4%). Upon further investigation, one respondent's surgery was a revision, an exclusion of the study, so the final sample size for the checklist group was 60.

Participants. Table 4 shows the participant data and group comparisons. There were no significant differences in sex, BMI, comorbidities, diagnosis, and complications. The SoC group was significantly older at 70.4 years (SD 8.0) compared to the checklist group at 64.2 years (SD 7.4), $t(125) = 4.55, p < .001$ with a large effect size (Cohen's $d = 0.80$). The survey window was the amount of time in months from the participant's surgery date to the date the survey was received in the mail. For the SoC group, the mean was 9.1 months (SD 2.56) and for the checklist it was 6.8 months (SD 0.61). The difference of 2.3 months was significant, $t(74.29) = 7.17, p < .001$, Cohen's $d = 1.24$, a very large effect size. The response rate was significantly larger for the checklist group at 82.4% compared to the SoC at 55.5%, $\chi^2(1, n = 142) = 15.59, p < .001, phi = .27$, slightly below a medium effect size.

Table 4

Participant Characteristics Quantitative Study

	SoC	Checklist	<i>t</i>	χ^2	<i>p</i>	ES
Age yrs., <i>M, SD (n)</i>	70.4, 8.0 (67)	64.2, 7.4 (60)	4.457		< .001	0.80 ^a
BMI, <i>M, SD (n)</i>	32.4, 7.8 (67)	34.1, 7.2 (60)	1.288		.200	0.23 ^a
Comorbidities, <i>M, SD (n)</i>	1.4, 1.06 (63)	1.5, 1.43 (56)	0.295		.768	0.05 ^a
Female, % (<i>n</i>)	58 (39)	60 (36)		0.042	.838	.02 ^b
OA diagnosis, % (<i>n</i>)	98.5 (66)	98.3 (59)		0.006	.937	-.01 ^b
Complications, % (<i>n</i>)	4.5 (3)	8.3 (5)		0.797	.372	.08 ^b
2nd TKR within 6 months, % (<i>n</i>)	9.0 (6)	3.3 (2)		1.695	.193	.12 ^b
Bilateral TKR, % (<i>n</i>)	6.0 (4)	0.0 (0)		3.699	.054	-.17 ^b
Living Arr., % (<i>n</i>)	62.7 (42)	66.7 (40)		0.018	.894	-.01 ^b
Occupation Type						
< PD, % (<i>n</i>)	38.8 (26)	50 (30)		0.716	.398	-.08 ^b
> PD, % (<i>n</i>)	46.3 (31)	43.3 (26)				
Survey window in months, <i>M, SD</i>	9.1, 2.6	6.8, 0.6	7.171		< .001	1.24 ^a
Response rate, % (<i>n</i>)	55.5 (81)	82.4 (61)		15.59	< .001	.27 ^b

Note. SoC = standard of care. BMI = body mass index. OA = osteoarthritis. RA = rheumatoid arthritis. TKR = total knee replacement. Living arr. = % (*n*) living with home companionship. PD = physically demanding. Survey window = time in months from TKR to date survey was received. *M* = mean. *SD* = standard deviation. *t* = *t*-test. χ^2 = chi-square. *p* = probability value. ES = effect size. ^a = Cohen's *d*. ^b = phi. Significance level is *p* < .05 and is indicated in bold.

After the surveys were received, four participants in the SoC group were found to have had a bilateral TKR and six SoC and two checklist participants had a TKR on the contralateral knee within 6 months of the index knee. These participants were kept in the

sample because it was felt they could still report on their satisfaction with the index knee. Analyses were run without these cases and the differences were maintained.

Satisfaction subscales. Five satisfaction subscales were derived from the original 12 items in the satisfaction VAS. For each scale, an average was obtained so that scores could theoretically range from 0 to 100. Reliability analyses were carried out for the four subscales with multiple items. Table 5 shows all Cronbach alphas (α) were above .90, indicating excellent internal consistency. With 2-3 items per scale, Pallant (2010) also recommends reviewing the mean inter-item correlations, which were good to excellent.

Table 5
Satisfaction Subscale Reliability Analyses

Scale Name and Corresponding Items	Cronbach α	Mean Inter-Item Correlations
TKR Satisfaction/Expectations Met	.92	.86
Results of TKR		
Surgery met expectations		
Surgeon Communication Ability	.97	.95
Surgeon's ability to communicate		
Answers to questions about recovery		
Information received about recovery		
Surgeon Care & Concern	.93	.84
Care and concern shown by surgeon		
Surgeon's ability to address concerns		
Surgeon's ability to listen		
Pain & Function	.96	.89
Results of TKR for improving pain		
Improving ability to do recreational activities		
Improving ability to do house or yard work		

TKR Satisfaction/Expectations. An independent *t*-test compared participants' reported overall satisfaction with the TKR and satisfaction with the degree to which the patients' expectations had been met. The checklist group had significantly higher ratings of TKR satisfaction/expectations met ($M = 87.26, SD = 17.01$) compared with the SoC group ($M = 77.19, SD = 28.41; t(106) = 2.42, p = .02$, two-tailed). The mean difference of 10.06 (95% *CI*: 1.83 to 18.29) was slightly below a medium effect size (Cohen's $d = 0.43$). A summary of all *t*-test results is found in Table 5 at the end of this section.

Surgeon's Communication Ability. The independent *t*-test comparing satisfaction with the surgeons' communication ability showed that the checklist group was significantly more satisfied ($M = 92.02, SD = 9.28$) compared to the SoC group ($M = 83.58, SD = 23.24; t(88) = 2.74, p = .01$, two-tailed). The mean difference was 8.43 (95% *CI*: 2.31 to 14.56), which indicated a medium effect size (Cohen's $d = 0.48$).

Care and Concern shown by the Surgeon. The independent *t*-test comparing the groups' satisfaction ratings of the care and concern shown by their surgeon showed higher ratings from the checklist group ($M = 91.99, SD = 10.05$) compared with the SoC group ($M = 83.92, SD = 22.46; t(88) = 2.61, p = .01$, two-tailed). The magnitude of difference between the two groups (mean difference 8.07 points, 95% *CI*: 1.92 to 14.22) showed a medium effect size (Cohen's $d = 0.46$).

Time in Follow-Up Visits. The independent *t*-test that compared the satisfaction with the time the surgeon spent during the post-operative follow-up visits showed the checklist group was significantly more satisfied ($M = 93.12, SD = 7.24$) compared to the SoC group ($M = 81.89, SD = 23.81; t(79) = 3.68, p < .001$, two-tailed). The mean difference

was 11.23 points (95% *CI*: 5.15 to 17.31), which was a greater than medium effect size (Cohen's $d = 0.64$).

Relief of Pain and Restoration of Function. The independent t -test that compared the patients' satisfaction with the TKR for relief from pain and restoration of function showed no statistically significant difference between the checklist group ($M = 85.31$, $SD = 20.39$) and the SoC group ($M = 76.96$, $SD = 27.95$; $t(110) = 1.87$, $p = .06$, two-tailed). Although the checklist groups' ratings were higher with a mean difference of 8.35 points (95% *CI*: - 0.48 to 17.18), it was slightly above a small effect size (Cohen's $d = 0.34$).

Duration of Clinic Visits. An independent t -test compared the mean duration in minutes of a random sample of SoC clinic visits (mean weeks post-TKR = 9) and the 6-week post-TKR times that had been recorded for the checklist group. The checklist visits were significantly longer ($n = 55$; $M = 5:53$, $SD = 2:38$) compared to the SoC ($n = 33$; $M = 4:02$, $SD = 2:11$; $t(87) = 3.39$, $p = .001$, two-tailed). The magnitude of difference was 1:51 (95% *CI*: 0:46 to 2:56), a large effect (Cohen's $d = 0.76$). A Mann-Whitney U of the median visit times (SoC 3:36 vs. checklist 5:18) was also significant, $p = .001$.

Table 6

Summary of t-tests

	SoC, M (SD)	Checklist, M (SD)	M Diff.	p	d
Time in Follow-up	81.9 (23.81)	93.1 (7.24)	11.2	< .001	0.64
Communication	83.6 (23.24)	92.0 (9.28)	8.4	.008	0.48
Care & Concern	83.9 (22.46)	92.0 (10.05)	8.1	.011	0.46
Satisfaction-Expectations	77.2 (28.41)	87.3 (17.01)	10.1	.017	0.43
Pain & Function	77.0 (27.95)	85.3 (20.39)	8.3	.064	0.34
Duration of Visits	4:02 (2:11)	5:53 (2:38)	1:51	.001	0.76

Note. SoC = standard of care. M Diff. = mean difference. p = probability value. d = Cohen's d effect size. M = mean. SD = standard deviation. Significance is $p < .05$, indicated in bold.

Odds Ratios. Table 7 shows the Cohen’s *d* effect size transformations (Lenhard & Lenhard, 2016) for the odds ratios of satisfaction. Using the example of time spent in follow-up, the odds of satisfaction were 3.2 higher when the checklist was used compared to when it was not used. Expressed another way, there was a 3.2-fold increased odds of satisfaction with the surgeon’s time spent in follow-up when the checklist was used.

TABLE 7
Satisfaction Odds Ratios

	<i>p</i>	Cohen’s <i>d</i>	Odds Ratio
Time Spent in Follow-up	< .001	0.64	3.19
Surgeon Communication	.008	0.48	2.39
Surgeon Care & Concern	.011	0.46	2.30
Satisfaction/Expectations	.017	0.43	2.18
Pain & Function	.064	0.34	1.85

Note. *p* = probability value from t-tests.

Holm-Bonferroni Correction. The Holm-Bonferroni correction was used to adjust for multiple hypothesis testing. Table 8 shows that the statistical significance reported from the *t*-tests were maintained when the Holm-Bonferroni correction was applied.

Table 8
Holm-Bonferroni Corrections

	<i>p</i>	H-B <i>p</i>	Significant
Time Spent in Follow-up	< .001	.010	Y
Surgeon Communication	.008	.013	Y
Surgeon Care & Concern	.011	.017	Y
Satisfaction/Expectations	.017	.025	Y
Pain & Function	.064	.050	N

Note. *p* = probability value from *t*-tests. H-B = Holm-Bonferroni correction. Y = yes. N = no.

Exploratory Analyses of Age and Sex. The results of the two-way between-groups analysis of variance (ANOVA) exploring age and sex on satisfaction is shown in Table 9.

Table 9

Exploratory Analysis of Age and Sex Differences in Satisfaction

Age	<i>F</i>	<i>p</i>	ηp^2
Time Spent in Follow-up	1.57	.21	.01
Surgeon Communication	1.82	.18	.01
Surgeon Care & Concern	1.12	.29	.009
Satisfaction/Expectations	3.50	.06	.03
Pain & Function	2.82	.10	.02
Age x Group Interactions	<i>F</i>	<i>p</i>	ηp^2
Time Spent in Follow-up	2.44	.12	.02
Surgeon Communication	0.90	.34	.007
Surgeon Care & Concern	1.75	.19	.01
Satisfaction/Expectations	0.37	.54	.003
Pain & Function	0.16	.69	.001
Sex	<i>F</i>	<i>p</i>	ηp^2
Time Spent in Follow-up	1.69	.20	.01
Surgeon Communication	1.67	.20	.01
Surgeon Care & Concern	1.40	.24	.01
Satisfaction/Expectations	3.54	.06	.03
Pain & Function	2.08	.15	.02
Sex x Group Interactions	<i>F</i>	<i>p</i>	ηp^2
Time Spent in Follow-up	2.44	.12	.02
Surgeon Communication	1.21	.27	.01
Surgeon Care & Concern	0.68	.41	.006
Satisfaction/Expectations	1.73	.19	.01
Pain & Function	1.99	.16	.02

Note. *F* = *F* statistic. *p* = probability value. ηp^2 = partial eta squared, “the proportion of variance of the dependent variable that is explained by the independent variable. Values can range from 0 to 1... small = .01 (1%), medium = .06 (6%), large = .14 (14%)” (Pallant, 2010).

A binary group comprised of younger (< 67 years) and older (\geq 67 years) participants was created to analyze the effects of age on the five satisfaction outcomes. The cut-off of 67 years was used because the average age of TKR patients in Canada in 2014-2015 was 67 years according to the Canadian Joint Replacement Registry (CIHI, 2017). The ANOVA with age as a factor showed no significant effect on the satisfaction measures, no significant interactions, but as reported above, the effect of group (checklist or SoC) was significant. The ANOVA for the binary variable of sex also showed no significant effect for any of the satisfaction measures, no significant interactions but the effect of group (checklist versus SoC) was significant. The partial eta squared effect sizes for the ANOVAs ranged from .001 to .03, which were small.

5.5 Discussion

This study addresses three inter-related issues, (1) the universal and robust finding that up to 20% of patients are dissatisfied with their total knee replacement surgery (TKR), which includes the role of unmet expectations, (2) time constrained patient-surgeon communication, and (3) the mixed findings of sex and age-related differences in TKR outcomes. The main goal of this quantitative study was to determine if the communication checklist resulted in significantly greater patient satisfaction 6 months post-TKR without unduly increasing the duration of clinic visits. The hypothesis that the checklist would increase the former but not the latter is generally supported, satisfaction increased in four of the five measures of satisfaction but contrary to the hypothesis, clinic visit times also increased significantly. Each finding is discussed in turn by the categories in which they were measured.

Satisfaction and Expectations. The checklist group reported their satisfaction with their TKR and their TKR meeting their expectations 10 points higher than the SoC group, which was significant. This suggests a clinically relevant difference considering the Cohen's *d* value of .43, which is just below a medium effect size. For this and all of the satisfaction measures, the relative difference in scores may be challenging to interpret. The International Society of Arthroplasty Registries (ISAR) Patient-Reported Outcome Measures (PROMs) Working Group noted, "The minimal change or difference estimates calculated for a specific PROMs instrument may vary with the method used, intervention features, population characteristics, and instrument range" (Rolfson et al., 2016, p. 19). This caveat aside, it nonetheless makes intuitive sense that a 10-point difference in the patient satisfaction-expectation measure is noteworthy considering almost all patient characteristics were similar, save age which will be discussed later.

The link between TKR satisfaction and expectations is well established in the literature (Bourne et al., 2010; Hamilton et al., 2013; Nilsson et al., 2009; Noble et al., 2006), despite criticisms around how expectations are defined and measured (Haanstra et al., 2012). The high internal consistency ($\alpha = .92$) of the satisfaction-expectation measure: satisfaction with... (1) the results of the surgery and, (2) the results of the surgery meeting patients' expectations, suggest these results align with the pattern of positive associations between TKR satisfaction and expectations reported elsewhere.

How did the checklist contribute to the significant difference in the satisfaction-expectation measure? One of the stated goals of the checklist was to help surgeons and their patients manage, set, or re-set patients' post-operative expectations. As noted earlier, Kravitz (1996) advances the concepts of *probability expectations*, namely

patients' perceptions about the likely occurrence of certain health outcomes or medical interventions, and *value expectations*, namely, the hopes, wishes, desires for these outcomes. Probability expectations are more cognitive or fact-based, objective orientations, and value expectations are more affective, subjective orientations. The checklist may be able to tap both probability and value expectations, allowing the surgeon to address both at the same time with the use of the checklist. For example, the checklist item 'pain at night' (and what to do about it), targets a probability expectation resulting in objective information being discussed. Conversely, the checklist item 'mental attitude' targets a value expectation, prompting a discussion about patient-specific experiences, such as the possibility of 'down days' or frustration with progress. This leads to the opportunity for the surgeon to reassure the patient that if this is experienced, it is usually short-lived and will pass as recovery progresses. It should be highlighted that the two checklist items used in this example came directly from the patient experiences reported in the qualitative study.

The use of the checklist over multiple visits also addresses what is proposed by Thompson and Suñol (1995), that expectations are dynamic, temporal and subject to internal and external influences. What is relevant for the patient at 6 weeks post-TKR may not have the same relevance at 3 months, as the patient looks further out to his or her long-term recovery. The checklist's flexibility allows surgeons to fine tune discussion items to each patients' individual stage of recovery and this too, may have contributed to better expectations management and as a result, increased satisfaction.

Ultimately, these differences in satisfaction-expectations suggest that the checklist provides a systematic way for surgeons to discuss patients' progress and expectations for

outcomes in a way that allows patients to better establish, or re-set, post-operative expectations that are more realistic and individualized, thus leading to increased satisfaction 6 months after their TKR.

Satisfaction with Surgeon Communication. In this measure an 8-point difference in satisfaction was observed with medium effect size. The three items comprising the measure were satisfaction with: (1) the surgeons' ability to communicate with the patient; (2) the answers received from the surgeons to the patients' questions about recovery; (3) the information received from the surgeons about the patients' recovery. This measure had high internal consistency ($\alpha = .97$) indicating excellent reliability.

A key component of patient satisfaction is good communication between the surgeon and patient which may be challenging because of external factors such as time-limited clinic follow-ups and internal factors such as the surgeon being able to intuit patients' information needs and expectations after only a few interactions. This is exacerbated by the traditional training orientations for surgeons that focus more on technical ability and knowledge and less on communication and empathy (Tongue et al., 2005). Moreover, although TKR can be viewed as a team effort involving the patient, assisting surgeon(s), anesthesiologist, nurses, physiotherapists, and other care providers, ultimately "the surgeon will be the only one responsible, facing patients or their family, in case something goes wrong" (Thienpont, 2015, p. 563). Good communication is essential when things go as expected, and more so when they do not.

Good communication like other technical skills that a surgeon possesses is needed for good clinical care. Communication skills can be honed and enhanced, especially when tapping into the clinical aptitudes that already exist in many physicians, such as,

“attentiveness, curiosity, flexibility, and presence” (Epstein, 2006, p. 276). The use of the checklist may have assisted in bringing these qualities to the fore by providing a foundation for enhanced communication resulting in better surgeon-patient interactions. Patients may have also viewed the checklist as evidence that the surgeons were ensuring follow-up care was more comprehensive and individualized to them because they may have felt the questions targeted their individual progress, issues, and concerns specifically.

Satisfaction with Care and Concern shown by Surgeon. The mean difference in scores on this measure between the SoC and the checklist groups is 8 points with a medium effect size. The three questions which comprise the measure, satisfaction with the: (1) level of care and concern shown by the surgeons, (2) surgeons’ ability to address concerns about recovery, and (3) surgeons’ ability to listen, show high internal consistency ($\alpha = .93$) for this measure.

Each section of the checklist includes an open-ended question wherein the surgeon could inquire about any additional issues or concerns regarding that particular checklist theme. Asking the patients’ about concerns or issues necessitates taking the time to listen and may have been an important contribution to the overall satisfaction reported in this measure. As Levinson et al. (2013) note, “feeling that the physician listened as a key component of satisfaction” (p. 15).

In a study of communication behaviours of physician specialists in Spain, the authors observed that most specialists “seemed to focus on the biomedical aspects of the disease and showed scarce empathic behaviours”(Ruiz-Moral, Pérez Rodríguez, Pérula de Torres, & de la Torre, 2006, p. 246). The authors also report that younger, better-educated, urban

dwelling patients received better communication behaviours from the specialists in the study. The generalizability of these findings to Canadian orthopaedic surgeons and patients is subject to debate because none of the specialists in Ruiz-Moral et al. (2006) were orthopaedic surgeons. Nonetheless, it is telling that differences in communication behaviours were observed depending on patient demographics such as education and urban vs. rural living.

A study of patient complaints in an orthopaedic service in the United States over a 16-year period found that after access and availability, the second most common complaint concerned humaneness/disrespect, and within that category specifically, lack of professionalism, rudeness, and condescension were the main sources of complaints. “Patients complain when they don’t feel listened to, respected, and appreciated for who they are” (King, van Dijk, Overbeek, Hageman, & Ring, 2017, p. 76). It is possible that the surgeons’ use of the checklist created the impression that the surgeons were providing more individualized, patient-centred care, which resulted in higher ratings on this measure.

Satisfaction with Time Spent in Follow-Up Visits. The observed mean difference in this score was 8.4 points with a greater than moderate effect size suggesting a clinically important effect. Understanding how the checklist could impact patients’ satisfaction with the time spent with the surgeon in follow-up visits begins with putting surgeon-patient interactions into context. As Morris (2013) note in an American Academy of Orthopaedic Surgeons Bulletin, “The acuity of some orthopaedic injuries does not always permit patients and surgeons to establish a strong patient-physician relationship prior to surgery”. I believe this is a challenge for elective surgery as well. Depending on wait

times, an elective TKR patient could wait 12 months or more for surgery after the decision to have surgery is made. When tallying the number of contacts the patient has with the surgeon from assessment to the final post-operative visit (usually) at 1 year, with no complications during recovery, there might only be seven or eight interactions over the course of up to 2 years. With this limited contact, it may be very difficult to establish good patient-surgeon rapport and even more challenging when post-operative follow-ups occur in a busy clinic setting. As Levinson et al., (2013) note, “Surgeons, like physicians, have limitations on their time, often clinics are overbooked and there is pressure not to detain clerical and nursing staff beyond their regular hours. In addition, they may feel ill-equipped to manage patients’ worries and emotions” (p. 15).

It is possible that the checklist provides a framework for the surgeons to systematically address potential issues or concerns in a way that make patients feel that the time spent in follow-up was appropriate for them specifically, leading to higher satisfaction scores on this measure.

Satisfaction with Relief of Pain and Restoration of Function. Although the difference in satisfaction was higher for the checklist group at 8.4 points, it was not significant and the effect size was small. The three items in the pain and function measure were satisfaction with the TKR for: (1) improving pain, (2) improving ability to do recreational activities the patient enjoys, and (3) improving the patients’ ability to do house or yard work. Combined these items had high internal consistency.

The lack of statistical significance and small effect size makes intuitive sense because a significant difference on this particular measure that assessed satisfaction with the TKR for improving pain and restoring function should not be affected by the use of a

communication tool like a checklist. Pain and function should not be influenced by the checklist in the same way that an evaluation of a surgeon's care and concern or communication ability might be. A significant difference would have suggested confounds such as demand characteristics, i.e., participants in the checklist group reporting higher satisfaction because they were more aware of participating in the research study than those in the standard of care group. Even though both groups completed the same mailed survey when they were past 6 months post-TKR, the checklist group likely saw the checklist in use during their follow-up appointments and this may have reinforced their awareness of participating in a research study. This heightened awareness may have contributed to higher scores on pain and function but ultimately the differences were not significant.

Timed Clinic Visits. There was a significant increase with a greater than medium effect size in the duration of clinic follow-up visits when the checklist was used. While the mean difference was less than 2 minutes, the clinical significance of the finding can be debated. Depending on the case mix, a surgeon could see 30, 40, or more patients in a weekly orthopaedic clinic. If one third of those are TKR follow-ups at various stages of recovery then an extra 2 minutes per visit could add 25 to 35 minutes to an already busy clinic day. A recent study of physician-patient perceptions in an orthopaedic clinic found that "More minutes with the physician was associated with reporting a better explanation, more concern for patients' worries, more efforts to include them in treatment decisions, more time spent together, and more confidence in their health care provider" (Zhang, Day, & Iorio, 2017, p. 244). This is the essence of good surgeon-patient rapport. A surgeon's investment of a few additional minutes to build rapport and enhance

communication with patients may, as Tongue et al. (2005) contend, improve patients' treatment adherence and satisfaction, thus reducing follow-up visits for unaddressed concerns, complications, or adverse outcomes, leading to less use of health care resources. In a discussion with one orthopaedic surgeon, an additional 2 minutes per patient was said to be well worth the investment in time when the result is greater satisfaction (W. W. Allanach, personal communication, 22 March, 2018). Ultimately any surgeon considering using the checklist has to decide for himself/herself whether a potential 2-minute difference, although statistically significant, is clinically relevant when patient satisfaction can be increased.

Exploratory Analysis on Age and Sex. Although there was a statistically significant age difference between the older SoC group and the relatively younger checklist group, age was not a significant effect in any of the five satisfaction measures from the two-way analysis of variance (ANOVA) carried out. One reason for this finding may be the interplay of chronological age and biological age. Chronological age is a simple metric; assessing biological age is more challenging (Belsky et al., 2015). The Dunedin Study sheds light on this distinction. This New Zealand study followed 1,037 people from birth to age 38 years with 95% retention rate. Physiological evidence of individual variation in aging was collected while the cohort was still free of age-related disease. Older biological age was associated with higher scores on a pace of aging metric, along with lower scores on balance, strength, and motor coordination, and greater physical limitations. Despite the significant chronological age difference of 6 years found in this study, the non-significant age effect from the ANOVA suggests that participants in the two groups may actually be similar in biological age. Non-significant findings in biopsychosocial factors

such as BMI, number of comorbidities, living arrangement, and occupational classification supports the hypothesis of biological age similarity, thus no age-related differences in satisfaction were observed as the satisfaction measures may have been more relevant to biological age versus chronological age. Future TKR satisfaction research should look for ways to distinguish between chronological versus biological age in participants.

The lack of a significant finding of sex differences in satisfaction is not surprising considering the literature shows some studies reporting sex/gender differences (Baker et al., 2007; Barrack et al., 2013; Ethgen et al., 2004) while other research does not (Merle-Vincent et al., 2011; Vissers et al., 2010). In sum, these results suggest the checklist is effective for the TKR patient population irrespective of age or sex.

5.6 Significance of the Quantitative Study

The goal of the quantitative study was to determine if the checklist would enhance surgeon-patient communication by helping surgeons to better co-manage patients' post-operative expectations by addressing questions and potential concerns in a more systematic way, and by doing so, significantly increase patient satisfaction. Used between the 6-week up to the 6-month follow-up visit, these findings show that the checklist helped surgeons communicate collaboratively with their patients to recalibrate patients' expectations for their TKR outcomes, which are recognized as being very much dependent on the patients' surgical experience, recovery, and rehabilitation. The checklist was intended to help surgeons more effectively discuss patients' expectations within the confines of time-limited follow-up visits. Ultimately, the use of the checklist contributes to greater patient satisfaction especially on the measures related specifically to

communication. This makes an important contribution not only to the orthopaedic literature, but also to orthopaedic surgical care specifically because rates of TKR in Canada are expected to continue to grow at a rapid pace due to our aging and increasingly obese population.

5.7 Limitations

The main limitation of the study is the generalizability of the findings because the sample was not randomly assigned. As noted earlier, randomization would have been difficult to achieve for two reasons. The first reason is efficiency: the checklist had to be developed from patient interviews and while that process was ongoing, the standard of care (SoC) patients were surveyed. Second, and more importantly, it was felt the checklist had to be introduced after the SoC patients had been surveyed because the checklist items and/or approach could have subconsciously influenced the surgeons' communication with the SoC patients had the checklist and SoC patients been randomized and surveyed concurrently.

The inability to account for potential patient confounders is also a limitation. For example, not knowing how long people waited for their TKR may have been a differentiator. A recent study found that patients who waited longer than 6 months for their TKR had significantly worse outcomes in certain physical and mental outcome measures, function scores, and satisfaction rates (Lizaur-Utrilla, Martinez-Mendez, Miralles-Munoz, Marco-Gomez, & Lopez-Prats, 2016). This is beyond the scope of this research, although wait times have been fairly consistent (16 to 24 months or longer) since 2014 at The Moncton Hospital. Nevertheless, there could be a breaking point in patients' patience with waiting that could have contributed to greater patient

dissatisfaction, although the chance of the distribution of these patients coalescing into the SoC group within the same time period across four surgeon seems unlikely.

Another patient characteristic which has been shown to influence outcomes is negative patient affect such as depression (Vissers et al., 2012) or pain catastrophizing (Forsythe, Dunbar, Hennigar, Sullivan, & Gross, 2008). Although mental health status was not assessed in this study, it is reasonable to assume that those with pain catastrophizing or depression were dispersed similarly across both groups.

Response bias may also be a confound; perhaps those in the checklist group (82.4% response rate) were more satisfied and as a result, were more likely to respond than those in the SoC group (55.5% response rate). A significant difference in response rate, such as what was observed in this study could indicate biased results (Stevens, Reininga, Boss, & van Horn, 2006). Reported response rates on patient satisfaction varies greatly in the literature, from 16.5% in a Press-Ganey patient satisfaction survey of 16,779 patients (Tyser, Abtahi, McFadden, & Presson, 2016) to over 95% from a study of 28,707 TKR patients in the Swedish Knee Arthroplasty Registry (Robertsson et al., 2000). Situated at the mid point between the two is the finding from CAHPS, the Consumer Assessment of Healthcare Providers and Systems, Clinician and Group (CG-CAHPS) survey which measured patients' experiences with health care providers and their office staff (Drake, Hargraves, Lloyd, Gallagher, & Cleary, 2014). The study looked at how different response scales, survey administration, and survey formats affect response rates. From a total sample of 6,500 patients who received various types and lengths of surveys by mail or telephone, the response rate ranged from 44.5% to 58.5%, which aligns with the lower response rate of the SoC group in this study.

Haynes et al. (2009) note that confounders such as temporal effects, e.g. seasonal variation, may bias research designs that use consecutive recruitment. Differences in participants' satisfaction in this study may be due to temporal trends such as one group having surgery within the fall and winter and the next group having surgery within the spring and summer. In the SoC group, surgeries and recovery periods occurred between May 2014 and June 2016, while the checklist groups' surgeries and recovery periods occurred between September 2016 and August 2017. So it appears both groups' surgery and recovery periods crossed multiple seasons. A detailed investigation of the potential effects of seasonal variation in the satisfaction rates is beyond the scope of this project but future research could investigate the interesting question as to whether the time and season of TKR recovery impacts satisfaction.

Another limitation may be the difference of 2.3 months in the survey window of time from the date of the surgeries to the date when the surveys were returned. The SoC group was 9.1 months while the checklist group was a tighter 6.8 months. The 6- to 12-month post-operative period is said to be a time when most clinically relevant improvements occur which may impact satisfaction (Browne, Bastaki, & Dawson, 2013). However Ethgen et al. (2004), in their review of the literature, cite seven studies in support of their statement that the greatest improvements occur within 3 to 6 months post-surgery. One could argue a difference of 2 months is a confounder and a consistent window should have been maintained for both groups. This highlights one of the challenges of applied research in a community hospital setting, to keep a more stringent window would have greatly increased the SoC survey collection time. Since the majority of the post-operative visits occur within the first 6 months, whether for the SoC group or the checklist group, it

was more appropriate to survey the patients' satisfaction after most of those visits occurred. Adding 6 months to the follow-up window would have increased the potential of loss to follow-up and more participants would have been required to maintain the power required for the study. Nonetheless, it would have been interesting to survey both groups again at 12 months to determine if the differences in satisfaction remained.

The inherent challenge in conducting research in settings where the potential for systematic error is difficult to minimize also includes the use of patient-reported outcome measures. It can be difficult to control for all types of potential confounders because of the biopsychosocial heterogeneity of patients overall. Moreover, as Dunbar (2001) notes, "questionnaires represent an imperfect attempt to quantify a largely qualitative phenomenon" (Dunbar, 2001, p. 46). The evidence derived from patient-reported outcome measures, while contributing to a better understanding patient outcomes, expectations, and satisfaction, is still comprised of signal and noise and the ongoing challenge is being able to parse the two, yet it is reassuring to consider:

This apparent deluge of noise is not, however, necessarily a negative event. Instead, the supposed noise may in fact represent a portion of the signal of interest, the signal of the art, or humanistic side, of healing. This is partially what the health outcomes researcher is interested in. Therefore, the thoughtful researcher should be aware of the limitations of outcomes questionnaires and do everything possible to amplify the signal of interest while at the same time reducing the noise in the metric. (Dunbar, 2001, p. 47)

5.8 Conclusion

The Orthopaedic Surgery Outcome Communication Checklist may be useful in clinical settings where the goals of patient-centered care and system efficiency can sometimes conflict. The main purpose of the checklist is to aid surgeons in better understanding and co-managing patients' post-operative expectations. The significance of these findings is that a simple communication tool can be implemented which enhances patient satisfaction without unduly sacrificing the efficiencies required in our current health care system where resources are scarce and expediency is a necessity, yet patient-centered care should still be the priority.

6.0 SUMMARY OF MIXED METHODS STUDY

6.1 Summary of Findings

The goal of this mixed methods study was to develop and test a communication checklist that was expected to optimize surgeon-patient interactions and increase patient satisfaction while maintaining the balance between the need for efficiency in clinic visits with the provision of effective patient-centered care. The three main research questions addressed were: (1) *What is the experience of recovering from TKR from the patients perspective?* (2) *Does the use of the communication checklist by the surgeon in post-TKR follow-ups from 6 weeks up to 6 months result in significantly greater patient satisfaction after 6 months?* and (3) *Does the use of the checklist add significantly more time to routine follow-up clinic visits?*

For these three inter-related questions, the equal-status sequential mixed methods design was the appropriate methodological approach. In the qualitative study, patients' experiences with TKR recovery were explored and two types of analyses were used to illuminate important themes of recovery from the patient's perspective. The communication checklist created from these patient-oriented themes was then used as the intervention in the quantitative study. The results of the quantitative study show that satisfaction significantly increased on measures that related to overall satisfaction/expectations, communication, care and concern, and time spent with the surgeon, but not on the measure of pain and function, which is appropriate considering the checklist is a communication intervention.

6.2 Practical Application

This study has practical applications for both orthopaedic surgeons in practice and for surgical training programs. Good communication can be enhanced with proper training and tools. The checklist is a tool that not only provides a systematic approach to mutual information sharing between surgeon and patient, but also provides an organized way for surgeons to assess and address patients' concerns or worries about their recovery. There is also a medico-legal benefit. The checklist as part of the patients' health record would be a document of the issues and concerns addressed by the surgeon with the patient (M.J. Dunbar, personal communication, 25 May, 2016). Above all, the checklist is not limited to TKR follow-ups, future research and adaptations could include the pre-operative period for TKR, other types of surgery and recovery within and beyond orthopaedics, and any other type of intervention where understanding patient expectations and satisfaction is critical.

6.3 Significance of the Mixed Methods Study

From an ongoing and detailed review of the orthopaedic literature, this appears to be the first study that applied a mixed methods approach in creating a communication tool that increased patient TKR satisfaction. The quantitative study was sufficiently powered to identify significant differences where they were evident. While both the qualitative and quantitative studies could exist as stand-alone research projects, the development and testing of the checklist was the point of interface, integral to the mixed methods design and the important and necessary link between the two studies.

The strength of the research is that it maintained a balance between the two key stakeholders who were the focus of the study, the patient and the surgeon. Their

perspectives and challenges were constantly being weighed in order to avoid privileging one over the other. If the process was too focused on the patient, the checklist might not be usable by the surgeon in the context of a busy clinic setting. Likewise if the process was too surgeon-focused, the ability to impact satisfaction might not have been achieved. The theoretical frameworks that guided the qualitative study, the biopsychosocial model of health and lifespan developmental theory, impacted the development of the checklist and extended into the quantitative study. The checklist was “of” the patient and “for” the patient and its biopsychosocial orientation was ostensibly masked by its biomedical appearance of check boxes and item classifications thus making it more accessible for surgeons already familiar with surgical checklists and ultimately translated into greater satisfaction for the patients.

6.4 Limitations of the Mixed Methods Study

Mixed methods research requires the researcher to possess methodological versatility because knowledge and experience in both qualitative and quantitative research is essential according to Morse and Niehaus (2009). At the beginning of this research study, I did not have equal parts of education and experience with both the qualitative and quantitative methodologies. The rationale for having two supervisors, each with the requisite knowledge and experience in qualitative and quantitative research respectively and more importantly, the interest in each others’ methodological orientations provided the academic guidance, support, and mentorship required to successfully complete the two studies that comprised this equal-status mixed methods study.

6.5 Directions for Future Research

There are a number of areas of interest that future research could address, seasonality of the recovery period, the influence of response shift, the impact of prolonged wait times on satisfaction, and the optimum number of post-operative visits for patient satisfaction, are a few that come to mind. Perhaps the most interesting avenue for investigation is how the checklist study could be adapted for the pre-and post-operative period so that better surgeon-patient communication could occur across the entire surgical care pathway.

6.6 Conclusion

The idea for this study originated from observing orthopaedic patients, how they navigated their TKR recoveries and how they communicated with their surgeons. Observing and talking with surgeons and understanding some of the challenges they face greatly influenced this study, as did the writings of Atul Gawande, an American surgeon, writer, and public health researcher. Gawande memorably recounted in his book, *The Checklist Manifesto: How to Get Things Right*, the story of US Airways Flight 1549. In January 2009, a flock of Canada geese flew into the path of an Airbus 329 just after takeoff from La Guardia airport in New York City. With both engines disabled, the captain believed the aircraft was unable to return to the airport so he and the co-pilot landed the aircraft in the Hudson River. The ‘ditching checklist’ they used aided them in landing in extraordinary circumstances without a single life lost, and the emergency evacuation checklist used by the cabin crew contributed to getting 150 passengers safely off the aircraft in 3 minutes (Gawande, 2010).

While not as dramatic as ditching a plane in the Hudson River, the application of a checklist in orthopaedic surgeon-patient communication is innovative. In the qualitative

study, the themes from patients' actual experiences recovering from TKR were the foundation of the checklist. The results of the quantitative study demonstrate that it is a simple and effective way to enhance surgeon-patient communication and increase patient satisfaction with TKR. This is important because patient satisfaction is a metric that is increasingly used as a key performance indicator for surgeons and health care institutions alike and rates of TKR are expected to grow dramatically in the coming decades due to increasing obesity and our aging population.

In conclusion, TKR is a well-established surgical procedure with high rates of clinical success yet patient satisfaction remains stubbornly fixed at about 80% despite advances in prosthesis design, surgical technique, and perioperative care. TKR satisfaction is a multifactorial construct that involves the surgeon using "correct patient selection, setting appropriate expectations, avoiding the preventable complications, knowing the finer points of the operation, and maximizing the use of pre- and post-operative pathways wherever possible" (Drexler, Dwyer, Chakraverty, Farno, & Backstein, 2013, p. 122). An important and necessary addition to this list is good surgeon-patient communication. The focus of this research was on enhancing communication in order to set (or re-set) and help manage patients' post-operative expectations. The contribution of this research to the goal of increasing patient satisfaction may be as simple as facilitating better dialogue between surgeons and patients with the use of a communication checklist so that patients can better understand what they as individuals can expect from their total knee replacement surgery.

"In the end, a checklist is only an aid. If it doesn't aid, it's not right.

But if it does, we must be ready to embrace the possibility" (Gawande, 2010, p. 184).

7.0 REFERENCES

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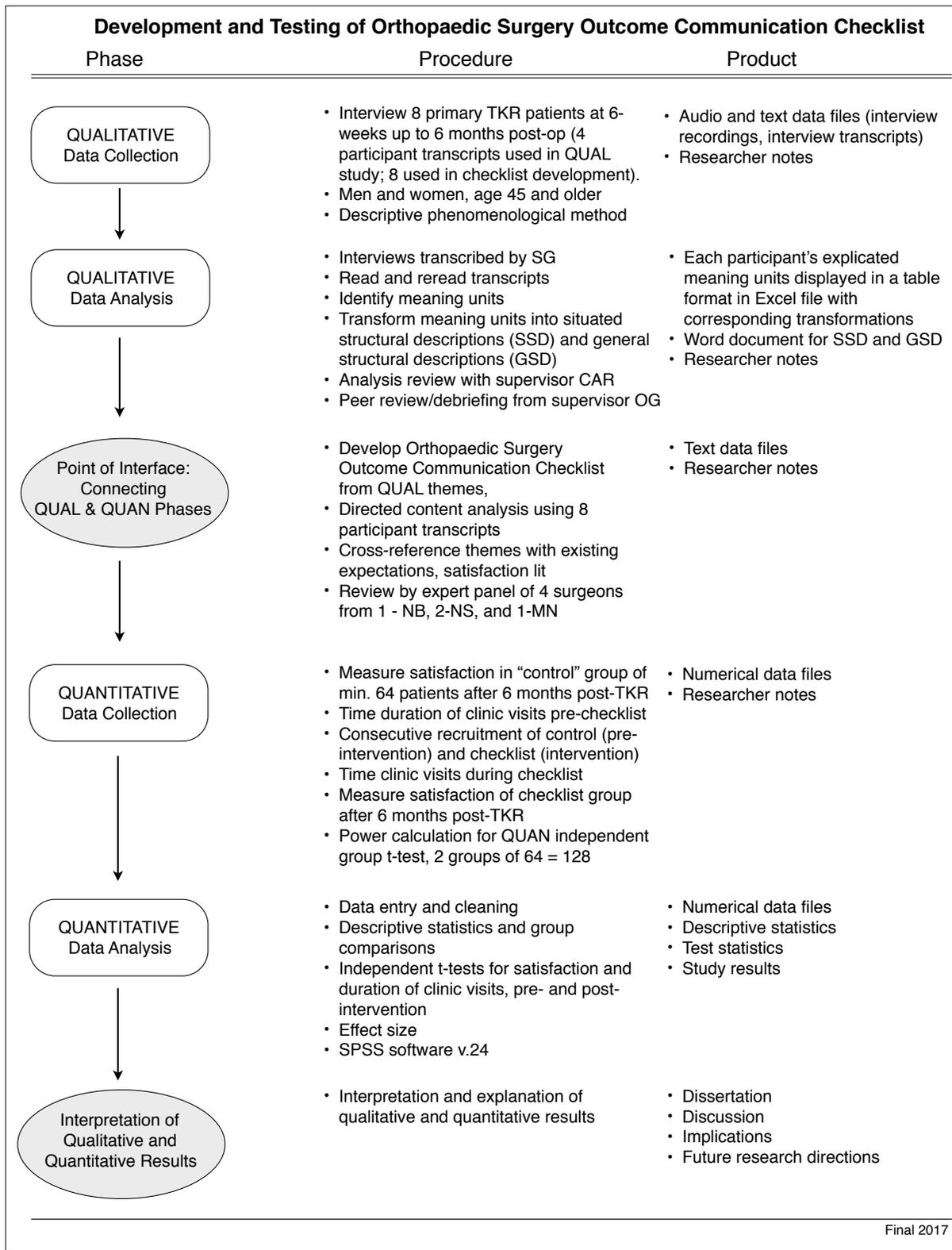
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Appendix I Diagram of Equal-Status Sequential Mixed Methods Study



Final 2017

Appendix II Informed Consent Form for Qualitative Research Study



CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE OF STUDY: Developing a Communication Checklist to Enhance Patient Satisfaction with Total Knee Replacement Surgery

PRINCIPAL INVESTIGATOR: Dr. Michael E. Forsythe

RESEARCHER: Sylvia Gautreau

INTRODUCTION

You have been asked to volunteer to participate in the research study named above. Before you can decide whether or not to volunteer, you must understand the purpose, how it may affect you, any risks to you, and what is expected of you. This process is called informed consent.

- Your participation is entirely voluntary;
- The quality of your care will not be affected by whether or not you participate;
- You may withdraw from the study at any time without affecting your present or future health care;
- If the study is changed in any way which could affect your willingness to stay in the study, you will be told about the changes and may be asked to sign a new informed consent;
- Your participation in this study may be stopped if your doctor decides it is in the best interest of your health and welfare.

PURPOSE OF STUDY

The purpose of this study is to examine the experiences of patients who have undergone total knee replacement surgery. We are asking patients of Dr. Michel E. Forsythe who meet the criteria for eligibility to take part in the study. If you choose to enter this study, you will be 1 of approximately 16 patients from The Moncton Hospital in this study.

PROCEDURE

The purpose of the study is to examine through a one-on-one interviews, patients' experiences of recovering after total knee replacement surgery. If you agree to be in this study, you will be one of eight people who are being interviewed at six weeks after their total knee replacement surgery, or one of eight people interviewed at six months after

their total knee replacement surgery. The study researcher will conduct all interviews, with supervision by the principal investigator. In the interview session a series of questions will be asked relating to your experiences with your recovery from total knee replacement surgery. The interview will take approximately 60 to 75 minutes. A demographics questionnaire will also be presented which will contain questions relating to your age, date of birth, years of education and level of income. You are free to answer only the questions you are comfortable answering. The interview session will be audio recorded and the content will be transcribed and analyzed by the researcher. For all questions, you are free to refuse to answer any that make you uncomfortable and you can withdraw from the study at any time.

POTENTIAL RISKS/DISCOMFORTS

There are risks with this, or any study. We want to make sure that if you decide to participate in the study, you have had a chance to think about the risks carefully. There may be risks that we do not yet know about.

For example: You may find a question (or questions) in the interview to be upsetting or distressing. You may not like all of the questions that you will be asked; therefore, you do not have to answer the questions you find upsetting or distressing. If you do find that the experience of taking part in the research has caused you severe anxiety or distress, we will provide you with the contact information of a professional who can assist you.

POTENTIAL BENEFITS

There are no direct benefits or compensation for taking part in the study. However, some people may benefit from the opportunity to share their life experiences within the context of this type of research.

In addition, you will contribute to the understanding of how patients like yourself experience recovery from total knee replacement surgery. This information may be used in the development of an intervention that may assist other patients undergoing total knee replacement surgery in the future.

ALTERNATIVES TO PARTICIPATION

If you do not participate in this study you will receive the same standard treatment as all patients who have undergone total knee replacement surgery.

QUESTIONS

If you have questions after you read this form, ask the doctor or researcher study for more information. You should not sign this form until you are sure that you understand the study.

If you have general questions or concerns about your rights as a research participant, you may contact someone not involved in the study, by calling the Horizon Health Network Research Ethics Board Chairperson at (506) 648-6094.

PRIVACY AND CONFIDENTIALITY

Protecting your privacy is an important part of this study. When you sign this consent form you give us permission to:

- Collect information from you.
- Share information with the people conducting the study
- Share information with the people responsible for protecting your safety

If you have questions or concerns about your privacy rights as a research participant, you may contact someone not involved in the study. You may contact the Privacy Officer for New Brunswick at the toll free number 1-877-422-8717.

Access to records

The study doctor and the researcher will have access to the study records that identify you by name. Other persons who may look at the study records that identify you by name might include:

- The Horizon Health Network Research Ethics Board, which is responsible for the protection of people in research conducted within the Horizon Health Network.

The transcribed interviews that we collect will be protected by the use of a code, which is an assigned number specific to your study file only. The researcher will be in control of the key, which is needed to decipher the code.

All information will be held confidential except when professional legislation or the law requires reporting. If you disclose anything about abuse of someone under the age of 19 years or the abuse of an older person, we will talk to you about this and we will need to tell the New Brunswick Department of Health and Wellness.

Use of records

The researcher will collect and use only the information they need to conduct the study. This information will include your:

- Date of birth
- Demographic information such as years of education; income
- Medical Conditions
- Information from study interviews and questionnaires.

The researchers will use your information to help develop an intervention to aid in increasing the positive outcomes of total knee replacement surgery. As well, the results of the study may be published in medical literature, but you will not be identified by name or any identifying characteristics. Your name and contact information will be kept secure by the research team. Your name will not appear in any report or article published as a result of this study. Information collected for this study will be kept as long as required by law. This could be up to seven years or more. If you decide to withdraw from the study, any information you provided to that point will be destroyed.

By signing this consent form, you agree that your information may be used as described above.

Your access to records: You may ask the study doctor or the researcher to see the information that has been collected about you.

RESEARCH RELATED INJURY

Neither the Horizon Health Network nor the Principal Investigator can guarantee or assure that the stated risk, or other unknown consequences will not occur. In the event that injury, illness or disability results and you believe it is directly related to your participation in this study, the Horizon Health Network requests that you contact the Horizon Health Network Patient Representative, at (506) 648-6714.

If you become ill or injured as a direct result of participating in this study, the Principal Investigator will ensure that you receive medical care at no cost to you. By signing this consent form you are in no way waiving your legal rights or releasing the Principal Investigators and Researcher from their legal or professional responsibilities.

COMPENSATION

You will not be paid to be in the study but you may be reimbursed for costs associated with taking part in the study such as parking costs.

PARTICIPANT'S RESPONSIBILITIES

In order for this project to be valid and complete, it is important that you comply with the requirements of the study (i.e., taking part in the one-on-one interview with the researcher). This requirement should be carefully considered prior to signing your consent.

ADDITIONAL INFORMATION

You are encouraged to ask questions at any time during the study. In the event that you are experiencing any adverse effects or have further questions about the study, please call the researcher, Sylvia Gautreau at 506-962-2294 and she will contact the appropriate person to address your concern.



CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE OF STUDY: Developing a Communication Checklist to Enhance Patient Satisfaction with Total Knee Replacement Surgery

PARTICIPANT’S QUESTIONS:	
Has this study been adequately explained to you?	__ YES __ NO
Have you had an opportunity to ask questions and discuss this study?	__ YES __ NO
Are you comfortable with the information that has been provided?	__ YES __ NO
Do you understand that you are free to withdraw from this study?	__ YES __ NO
Do you understand that you will receive a signed copy of this consent?	__ YES __ NO
Do you give permission for you to be quoted anonymously in any published report of this research?	__ YES __ NO

PARTICIPANT’S STATEMENT

I have read the above information and understand the purpose of the research as well as the potential benefits and risks of participation in the study. I have had the opportunity to ask questions, and all my questions have been answered. I hereby give my informed consent to be a participant in this study.

_____	_____	_____
Printed Name of Participant	Signature of Participant	Date

_____	_____	_____
Printed Name of Person Conducting Informed Consent Discussion	Signature of Person Conducting Informed Consent Discussion	Date

INVESTIGATOR’S/DELEGATE’S STATEMENT

I believe that the participant understands the details of the study, its implications and the voluntary nature of the study.

_____	_____	_____
Investigator (Print)	Signature of Investigator	Date

Appendix III Qualitative Interview Protocol

Main interview question:

Please tell me about a specific situation or event that illustrates your experience so far in the recovery from your knee replacement surgery. Please be as specific and as detailed as possible.

Follow-up questions:

- For clarification/explication:

Can you tell me more about... X? (Repeat patient's own words)

- Can you tell me about a situation or event when you were concerned or unsure about what to do in terms of your recovery from your surgery?

- Is there any information that you wish you had known before your surgery that would help you now as you are recovering?

- Is there any information you wanted to ask your surgeon but didn't have the chance to?

- *Possible follow-up question for 6-months patients only:* What advice would you give to someone you know who is going to have this surgery?

Appendix IV Orthopaedic Surgeon Outcome Communication Checklist

ORTHOPAEDIC SURGERY OUTCOME COMMUNICATION CHECKLIST

Pt. Name: _____ MO#: _____ DoS: ____/____/____(D/M/Y)

This is post-op appointment: **6 weeks** **3 months** **6 months**

This checklist is to be used by you (the surgeon) as a communication tool to discuss recovery expectations and outcomes with your patient. **This supposes you will review/comment on patients' x-rays (if applicable). ONLY CHECK/DISCUSS APPLICABLE ITEMS.** Reference guide on reverse.

PAIN	<input type="checkbox"/> What you can expect for pain <input type="checkbox"/> Pain at night <input type="checkbox"/> Normal post-op knee pain/sensitivity <input type="checkbox"/> Managing pain <input type="checkbox"/> Other pain questions/concerns? <input type="checkbox"/> No pain issues	Notes: _____ _____ _____ _____ _____
MEDS	<input type="checkbox"/> Medication side effects <input type="checkbox"/> Dependency <input type="checkbox"/> Pain management <input type="checkbox"/> Other medication questions/concerns? <input type="checkbox"/> No medication issues	Notes: _____ _____ _____ _____
PHYSIO	<input type="checkbox"/> Role of physiotherapy <input type="checkbox"/> Range of motion and straight leg raise <input type="checkbox"/> Managing physiotherapy pain <ul style="list-style-type: none"> • Pain medication • Non-medicinal treatments <input type="checkbox"/> Other physio questions/concerns?	Notes: _____ _____ _____ _____ _____
GENERAL	<input type="checkbox"/> What you can expect for recovery <input type="checkbox"/> Return to activities (e.g. driving, work, sports) <input type="checkbox"/> Concern about falls and injuries <input type="checkbox"/> Mental attitude <input type="checkbox"/> Other general questions/concerns?	Notes: _____ _____ _____ _____ _____

V.3 OSOCC_FINAL_NOV2016

Surgeon Signature: _____ Date: ____/____/____(D/M/Y)

ORTHOPAEDIC SURGERY OUTCOME COMMUNICATION CHECKLIST REFERENCE GUIDE

SUGGESTED INTRODUCTION BY SURGEON TO PATIENT: "The items on this checklist were identified in research with patients just like you, recovering from knee replacement surgery. I am using it today as part of your follow-up to help you manage your recovery. As I review each item, I will provide specific information from my assessment of how your surgery went, your progress to date, and generally how most people do at this point in the recovery period. I will also answer any questions you have".

Pain Experience

- **Expectations for pain:** at this stage of recovery pain is usually... and by # weeks (or months) you can expect your pain to...
- **Pain at night:** Some people experience pain at night; you may need pain medication at night to help you sleep, sleep is important
- **Normal post-op knee pain/sensitivity:** Explain what normal pain/sensitivity is, why it can happen, and how long it may occur; May also want to address clicking
- **Managing pain:** It is important to manage pain during the early stages of recovery...
- **Questions:** Additional questions/concerns
- **No pain issues:** confirm

Medication

- **Medication side effects:** If you are experiencing side effects, don't discontinue the medication, it is better to find something without side effects if you still have pain... if issues, other options...
- **Dependency:** Some people are concerned about dependence on pain medication, the risk is very rare, and it is important for recovery to manage your pain...
- **Pain management:** Your requirement for pain medication will change over time...
- **Questions:** Additional questions/concerns
- **No medication issues:** confirm

Physiotherapy

- **Role of physiotherapy:** explain briefly
- **Range of motion and straight leg raise:** explain RoM and SLR progress
- **Managing physiotherapy pain**
 - **Pain medication:** recommend taking medication 30-45 min. before physio session to do exercises without pain
 - **Non-medicinal treatments:** Using ice and elevation; how long; how often...
- **Questions:** Additional physiotherapy questions or concerns

General Information

- **Expectations for recovery:** Based on my assessment of your knee before surgery, the surgery itself, and how you are doing so far...I expect your recovery will be...
- **Return to activities:** Depending on your activity level and the type of activities you do, you can expect... (include driving, work, or sports, if applicable)
- **Falls/Injuries:** You may be concerned about falling or injuring your knee in some way, things to look out for are...
- **Mental attitude:** Explain importance of a positive attitude for recovery; there may be "down days" or frustration with progress but it will pass...
- **Questions:** Additional questions/concerns

V3 OSOCC_FINAL_NOV2016

Appendix V Informed Consent Form for Quantitative Research Study (SoC Group)



CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Title of Study: Developing a Communication Checklist to Enhance Patient Satisfaction with Total Knee Replacement Surgery

Clinical Co-Investigator: Dr. Michael E. Forsythe

Co-Investigators: Dr. William Allanach, Dr. Andrew Clark,
Dr. Jean-Pierre Daigle, Dr. Steven Massoeurs

Principal Investigator: Sylvia Gautreau

Dear _____,

As a patient of one of the orthopaedic surgeons named above, you are invited to take part in a research study. Your participation is entirely voluntary. The quality of your care now or in the future will not be affected by whether or not you participate.

In this study, we are investigating patient satisfaction with their knee replacement surgery, and the communication patients have with their surgeon after total knee replacement surgery. The study involves the completion of a questionnaire by patients who have had this type of surgery. Patients who chose to take part in the study are being asked to complete the attached questionnaire and return it in the stamped addressed envelope that is enclosed to the Principal Investigator named above. The questionnaire should take approximately 5-10 minutes to complete. We also ask for your consent to collect information from your health record that will help us compare groups of patients in the study. The results of this study will contribute to the PhD doctoral dissertation of the principal investigator named above, and may be submitted for publication in academic journals and presented at scholarly conferences. The returned, completed

surveys will be stored within a secure location at The Moncton Hospital, Horizon Health Network.

If you have any questions about your participation in this study, please contact the principal investigator, Sylvia Gautreau, by email at sylviamacneil.gautreau@gmail.com or by telephone at 506-962-2294. You may also contact the clinical co-investigator, Dr. Michael E. Forsythe by e-mail at dr.michael.e.jr.forsythe@horizonnb.ca or by telephone at 506-857-0080.

By completing the attached questionnaires and returning them in the addressed, stamped envelope provided, you are indicating that you fully understand the above information and agree to participate in this study. When you have completed the questionnaires, please place all pages in the stamped envelope provided and drop in a mailbox. If you choose not to participate in the survey, you do not need to fill out or return the questionnaires.

This research has been reviewed and approved by the Horizon Health Network Research Ethics Board. The data collected for this research will be kept in a secure location for seven years, at which time it will be disposed of in accordance with Horizon Health Network Research protocol. If you have questions or concerns about your privacy rights as a research participant, you may contact, the Privacy Officer for New Brunswick at the toll free number 1-877-422-8717. If you wish to speak with someone about your rights as a research participant, please contact the Horizon Health Network Ethicist at (506) 648-6556.

Thank you.

Sylvia Gautreau,
Principal Investigator
The Moncton Hospital
Horizon Health Network

Dr. Michael E. Forsythe,
Clinical Co-Investigator
Orthopaedic Surgeon,
The Moncton Hospital, HHN

Appendix VI Informed Consent for Quantitative Research Study (Checklist Group)



CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Title of Study:	Developing a Communication Checklist to Enhance Patient Satisfaction with Total Knee Replacement Surgery
Clinical Co-Investigator:	Dr. Michael E. Forsythe
Co-Investigators:	Dr. William Allanach, Dr. Andrew Clark, Dr. Jean-Pierre Daigle, Dr. Steven Massoeurs
Principal Investigator:	Sylvia Gautreau

INTRODUCTION

You have been asked to volunteer to participate in the research study named above. Before you can decide whether or not to volunteer, you must understand the purpose, how it may affect you, any risks to you, and what is expected of you. This process is called informed consent.

- Your participation is entirely voluntary;
- The quality of your care will not be affected by whether or not you participate;
- You may withdraw from the study at any time without affecting your present or future health care;
- If the study is changed in any way which could affect your willingness to stay in the study, you will be told about the changes and may be asked to sign a new informed consent;
- Your participation in this study may be stopped if your doctor decides it is in the best interest of your health and welfare.

PURPOSE OF STUDY

The purpose of this study is to develop a communication tool that will enhance the quality of patient-surgeon post-operative interactions and increase patient satisfaction with total knee replacement surgery.

PROCEDURE

We are asking patients of the orthopaedic surgeons named above who meet the criteria for eligibility to take part in the study. If you choose to enter this study, you will be one of approximately 128 patients from The Moncton Hospital in this study.

A communication checklist has been developed from interviews with other patients like yourself who have undergone total knee replacement surgery. Your surgeon will use this checklist to guide discussions with you about your recovery from your total knee replacement surgery. The communication checklist will be used at post-operative follow-up appointments up to six months. At six months, patients who take part in the study will receive a questionnaire in the mail and be asked to complete it and return it by mail to the principal investigator in the department of research services at the Moncton Hospital. A demographics questionnaire will also be included which will contain questions relating to age, other medical conditions, years of education and occupation. A postage-paid, addressed envelope will be included in the questionnaire packet.

The questionnaire should take approximately 5-10 minutes to complete. We will not ask for your name on the questionnaires, and your responses will not be shared with anyone except the researchers on the project. The results of this study will contribute to the PhD doctoral dissertation of the principal investigator named above, and may be submitted for publication in academic journals and presented at scholarly conferences. The returned, completed surveys will be stored within a secure location at The Moncton Hospital.

POTENTIAL RISKS/DISCOMFORTS

There are risks with this, or any study. To give you the most complete information available, we have listed some *possible* risks. We want to make sure that if you decide to take part in the study, you have had a chance to think about the risks carefully. Please be aware that there may be risks that we don't yet know about.

For example: You may find a question in the questionnaire to be upsetting or distressing. If you do find that the experience of taking part in the research has caused you any anxiety or distress, we will provide you with the contact information of a professional who can assist you.

POTENTIAL BENEFITS

There are no direct benefits or compensation for taking part in the study. However, you will contribute to the understanding of how patients like yourself experience recovery from total knee replacement surgery.

ALTERNATIVES TO PARTICIPATION

If you do not participate in this study you will receive the same standard treatment as all patients who have undergone total knee replacement surgery.

QUESTIONS

If you have questions after you read this form, ask the clinical co-investigator or the principal investigator for more information. You should not sign this form until you are

sure that you understand the study. If you have general questions or concerns about your rights as a research participant, you may contact someone not involved in the study, by calling the Horizon Health Network Ethicist at (506) 648-6556.

PRIVACY AND CONFIDENTIALITY

Protecting your privacy is an important part of this study. When you sign this consent form you give us permission to:

- Collect information from you.
- Share your de-identified information with the people conducting the study
- Share information with the people responsible for protecting your safety

If you have questions or concerns about your privacy rights as a research participant, you may contact someone not involved in the study. You may contact the Privacy Officer for New Brunswick at the toll free number 1-877-422-8717.

Access to records

The study doctors and the researcher will have access to the study records that identify you by name. Other persons who may look at the study records that identify you by name might include:

- The Horizon Health Network Research Ethics Board, which is responsible for the protection of people in research conducted within the Horizon Health Network.

Use of records

The researcher will collect and use only the information needed to conduct the study.

This information will include your:

- Date of birth
- Demographic information such as years of education; income
- Medical conditions
- Information from the questionnaires

The results of the study may be published in the academic or medical literature, but you will not be identified by name or any identifying characteristics. Your name and contact information will be kept secure by the researchers. Your name will not appear in any report or article published as a result of this study. Information collected for this study will be kept as long as required by law. This could be up to seven years or more. If you decide to withdraw from the study, any information you provided to that point will be destroyed.

By signing this consent form, you agree that your information may be used as described above.

Your access to records: You may ask the clinical co-investigator, co-investigators or the principal investigator to see the information that has been collected about you.

RESEARCH RELATED INJURY

Neither the Horizon Health Network, the clinical co-investigator, co-investigators, nor the principal investigator can guarantee or assure that the stated risk, or other unknown consequences will not occur. In the event that injury, illness or disability results and you believe it is directly related to your participation in this study, the Horizon Health Network requests that you contact the Horizon Health Network Patient Representative at (506) 648-6714. If you become ill or injured as a direct result of participating in this study, the clinical investigator and co-investigators will ensure that you receive medical care at no cost to you. By signing this consent form you are in no way waiving your legal rights or releasing the clinical investigator, the co-investigators, or the principal investigator from their legal or professional responsibilities.

COMPENSATION

You will not be paid to participate in the study.

PARTICIPANT'S RESPONSIBILITIES

In order for this project to be valid and complete, it is important that you comply with the requirements of the study (i.e., completing the questionnaire and returning it to the principal investigator). This requirement should be carefully considered prior to signing your consent.

ADDITIONAL INFORMATION

You are encouraged to ask questions at any time during the study. In the event that you are experiencing any adverse effects or have further questions about the study, please contact the principal investigator, **Sylvia Gautreau, by email at sylviamacneil.gautreau@gmail.com or by telephone at 506-962-2294.** You may also contact the clinical co-investigator, Dr. Michael E. Forsythe by e-mail at dr.michaele.jr.forsythe@horizonnb.ca or by telephone at 506-857-0080.



CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE OF STUDY: Developing a Communication Checklist to Enhance Patient Satisfaction with Total Knee Replacement Surgery

PARTICIPANT’S QUESTIONS:

Has this study been adequately explained to you? YES NO

Have you had an opportunity to ask questions and discuss this study? YES NO

Are you comfortable with the information that has been provided? YES NO

Do you understand that you are free to withdraw from this study? YES NO

Do you understand that you will receive a signed copy of this consent? YES NO

PARTICIPANT’S STATEMENT

I have read the above information and understand the purpose of the research as well as the potential benefits and risks of participation in the study. I have had the opportunity to ask questions, and all my questions have been answered. I hereby give my informed consent to be a participant in this study.

Printed Name of Participant	Signature of Participant	Date

Printed Name of Person Conducting Informed Consent Discussion	Signature of Person Conducting Informed Consent Discussion	Date

INVESTIGATOR’S STATEMENT

I believe that the participant understands the details of the study, its implications and the voluntary nature of the study.

Principal Investigator (Print)	Signature of Principal Investigator	Date

Co-Investigator (Print)	Signature of Co-Investigator	Date

Appendix VII Satisfaction Questionnaire

Total Knee Replacement Satisfaction Questionnaire

For each question please mark a 'X' on the line below that best indicates your response. Example: 

Please feel free to be as open and honest as possible with your responses, you have been assigned a study code (indicated below) so your surgeon will not see your answers to these questions. Thank you for completing this questionnaire.

1. Please mark a 'X' on the line below that best indicates **how satisfied you are with the results of your knee replacement surgery.**

Completely Dissatisfied | _____ | Completely Satisfied

2. Please mark a 'X' on the line below that best indicates how satisfied you are with the results of your knee replacement surgery **for improving your pain.**

Completely Dissatisfied | _____ | Completely Satisfied

3. Please mark a 'X' on the line below that best indicates how satisfied you are with the results of your knee replacement surgery **for improving your ability to do recreational activities that you enjoy.**

Completely Dissatisfied | _____ | Completely Satisfied

4. Please mark a 'X' on the line below that best indicates how satisfied you are with the results of your knee replacement surgery **for improving your ability to do your house or yard work.**

Completely Dissatisfied | _____ | Completely Satisfied

Study ID# _____

ECC_SatisfactionV2_Oct2014

1

Total Knee Replacement Satisfaction Questionnaire

5. Please mark a 'X' on the line below that best indicates how satisfied you are that your knee replacement surgery **met your expectations**.

Completely Dissatisfied |-----| Completely Satisfied

6. Please mark a 'X' on the line below that best indicates how satisfied you are with **the information you received from your surgeon about your recovery**.

Completely Dissatisfied |-----| Completely Satisfied

7. Please mark a 'X' on the line below that best indicates how satisfied you are with **your surgeon's ability to communicate with you**.

Completely Dissatisfied |-----| Completely Satisfied

8. Please mark a 'X' on the line below that best indicates how satisfied you are with **the answers you received from your surgeon to your questions about your recovery**.

Completely Dissatisfied |-----| Completely Satisfied

9. Please mark a 'X' on the line below that best indicates how satisfied you are with the **amount of time your surgeon spent with you during your post-surgery appointments**.

Completely Dissatisfied |-----| Completely Satisfied

Study ID# _____

ECC_SatisfactionV2_Oct2014

2

Total Knee Replacement Satisfaction Questionnaire

10. Please mark a 'X' on the line below that best indicates how satisfied you are with **your surgeon's ability to address your concerns about your recovery.**

Completely Dissatisfied |-----| Completely Satisfied

11. Please mark a 'X' on the line below that best indicates how satisfied you are with **the level of care and concern your surgeon showed you during your recovery.**

Completely Dissatisfied |-----| Completely Satisfied

12. Please mark a 'X' on the line below that best indicates how satisfied you are with **your surgeon's ability to listen to you.**

Completely Dissatisfied |-----| Completely Satisfied

If you have anything else you would like to tell us about your recovery or your communication with your surgeon, please write it here:

_____ (if more space is needed, please continue on the reverse).

Study ID# _____

ECC_SatisfactionV2_Oct2014

3

Appendix VIII Patient Information Sheet

Please complete the following:

Current Age:

Gender (please circle one): Male / Female

Current Height: ___feet ___ inches

Current Weight: lbs
--

Other Medical Conditions:

Occupation:
* If retired, occupation before retirement: _____

Living Arrangement (please circle one):
Married/Common Law Single Widowed Divorced Living with Family/Friends

For Research Use Only	
Date Returned: _____	Study ID#: _____

Appendix IX Ongoing Informed Consent Form (Checklist Group)



ONGOING CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE OF STUDY: Patient Satisfaction with Total Knee Replacement Surgery

PRINCIPAL INVESTIGATOR: Sylvia Gautreau

CLINICAL CO-INVESTIGATORS: Dr. Michael E. Forsythe, Dr. William Allanach,
Dr. Andrew Clark, Dr. Steven Massoeurs

Dear _____,

Six months ago you consented to take part in the voluntary research study named above. In this study, a communication checklist was developed from interviews with other patients like yourself who had undergone total knee replacement surgery. Your surgeon has used this checklist to guide discussions with you during your post-operative follow-up appointments up to six months.

To complete the study, we are now asking you to complete the enclosed questionnaire. It should take approximately 5-10 minutes. We do not ask for your name on the questionnaire, responses will be recorded by the study number given to each participant. The results of this study will contribute to the PhD doctoral dissertation of the principal investigator named above, and may be submitted for publication in academic journals and presented at scholarly conferences.

If you have any questions about your participation in this study, please contact the principal investigator, **Sylvia Gautreau, by telephone at 506-962-2294 or by email at sylviamacneil.gautreau@gmail.com.**

When you have completed the questionnaires, please place all pages in the stamped envelope provided and drop in a mailbox.

This research has been reviewed and approved by the Horizon Health Network Research Ethics Board. The data collected for this research will be kept in a secure location for seven years, at which time it will be disposed of in accordance with Horizon Health Network Research protocol. If you have questions or concerns about your privacy rights as a research participant, you may contact, the Privacy Officer for New Brunswick at the toll free number 1-877-422-8717. If you wish to speak with someone about your rights as a research participant, please contact the Horizon Health Network Ethicist at (506) 648-6556.

Thank you,

Sylvia Gautreau,
Principal Investigator
The Moncton Hospital
Horizon Health Network

CURRICULUM VITAE or CV

Candidate's full name

Sylvia Joy Gautreau

Universities attended

University of New Brunswick, 2013 – Present. PhD (Candidate), Interdisciplinary Studies, Health Services Research

Mount Allison University, 2012, B.A. Psychology, First Class Honours with Distinction

Publications

Gautreau, S., Aquino-Russell, C., Gould, O. N., and Forsythe, M. E. (2016) In their own words: A short report of patients' experiences of recovering from total knee replacement. *Musculoskeletal Care*, doi: 10.1002/msc.1169

Gautreau, S., Gould, O. N., & Forsythe, M. E. (2016). Aging and orthopedics: How a lifespan development model can inform practice and research. *Canadian Journal of Surgery*, 59, 281–286. <http://doi.org/10.1503/cjs.008215>

Gould O.N., & Gautreau S. (2014) Empathy and conversational enjoyment in younger and older adults. *Experimental Aging Research*, (40), 60–80. doi:10.1080/0361073X.2014.857559.

Conference Presentations

Gautreau, S., Aquino-Russell, C., Gould, O.N., & Forsythe, M.E. (2017, September). Developing a communication checklist to increase patient satisfaction with total knee replacement surgery: Preliminary findings, Atlantic Provinces Orthopaedic Society Annual Meeting, Halifax, NS, Canada

Gautreau, S., Aquino-Russell, C., Gould, O.N., & Forsythe, M.E. (2016, June). Developing a communication checklist to increase patient satisfaction with total knee replacement surgery: Results from phase one of a mixed methods study, The Moncton Hospital Dr. Donald MacLellan Research Day, Moncton, NB, Canada

LeBlond, L., Gautreau, S., Turner, B., Murray, J., & **Forsythe, M.E.** (2016, June). Correction of flexion contracture in total knee arthroplasty: Technical aspects and 3-year clinical results, The Moncton Hospital Dr. Donald MacLellan Research Day, Moncton, NB, Canada

Gautreau S., Coles A., Murray J., Clark A., & **Forsythe M.E.** (2015, June). Sequential vs. staged bilateral total knee replacement: Determining patient appropriateness. Canadian Orthopaedic Association, Vancouver, BC Canada

Gautreau S., Coles A., Murray J., Clark A., & Forsythe M.E. (2014, June). Sequential vs. staged bilateral total knee replacement: Determining patient appropriateness. The Moncton Hospital Dr. Donald MacLellan Research Day, Moncton, NB, Canada

Gautreau, S. & **Gould, O.N.** (2012, November). Reminiscence and intergenerational communication. Poster presented at the Gerontological Society of America Meeting, San Diego, CA.

Gautreau, S. & Gould, O.N. (2012, May). Empathy and intergenerational conversational enjoyment. Poster presented at the Association for Psychological Science Meeting, Chicago, IL.