

**INTERPROFESSIONAL COLLABORATION IN THE OPERATING ROOM:
A NURSING PERSPECTIVE**

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Preface

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Thesis Abstract

The aim of this thesis was to examine the contribution of nurses to interprofessional collaboration (IPC) in the operating room (OR) guided by the Interprofessional Education Collaborative Patient Care Practice (IECPCP) framework. First, a secondary analysis of interviews with 19 registered nurses was conducted. Twenty emergent themes were identified. The most prevalent of the four dimensions (internalization; shared goals and vision; governance; and formalization) consisted of the internalization dimension relating to human interaction and sense of belonging within the interprofessional team. A scoping review then identified 20 studies evaluating four interventions (briefings, checklists, team training, and debriefings) used to improve IPC in the OR. Despite weak study designs, these interventions showed improvements in communication, teamwork, and safety outcomes. OR nurses contribute mainly through interactional processes and they require organizational support to foster their efforts in IPC. Nurse are involved in all IPC interventions and their contribution is important to support IPC in the OR.

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List Abbreviations

AHRQ	Agency for Healthcare Research and Quality
APN	Advance Practice Nurse
CAD	Canadian
CNA	Canadian Nurses Association
CIHI	Canadian Institute for Health Information
CPSI	Canadian Patient Safety Institute
CRM	Crew Resource Management
DoD	Department of Defence
IECPCP	Interprofessional Education for Collaborative Patient-Centred Practice
IPC	Interprofessional Collaborative
IP	Interprofessional
IPIP	International Personality Item Pool
MDN	Median
N/A	Not Assessed
N/R	Not Reported
NOTECHS II	Oxford Non-Technical Skills updated version
OR	Operating Room

ORBAT	Operating Room Briefing Assessment Tool
RCT	Randomized Controlled Trial
RNAO	Registered Nurses Association of Ontario
SAQ	Safety Attitudes Questionnaire
TDF	Theoretical Domains Framework
TEAMSTEPPS	Team Strategies and Tools to Enhance Performance and Patient Safety
TOH	The Ottawa Hospital
TOH IPMPC	Inter-Professional Model of Patient Care
WHO	World Health Organization

Chapter One

Introduction

Introduction

In Canada, the rate of adverse events causing patient harm is one in every 18 hospitalizations (Canadian Institute for Health Information (CIHI) & Canadian Patient Safety Institute (CPSI), 2016). Of these, one in eight cases ends in death (Canadian Institute for Health Information (CIHI) & Canadian Patient Safety Institute (CPSI), 2016). Harm is defined as “an unintended outcome of care that may be prevented with evidence-informed practices” (CPSI, 2021). Nearly 25% of all adverse events occur within procedural-associated events (e.g., surgical and medical procedures) (CIHI, 2020). A large proportion of surgical adverse events are preventable, with 62.5% attributable to human factors (e.g., ineffective interprofessional collaboration (IPC)) and 13% to organizational factors (e.g., inadequate, or unavailable protocols, cultural aspects, management priorities, inadequate transfer of information) (Mazzocco et al., 2009; Zegers et al., 2011). Surgical adverse events can lead to more permanent disability, unplanned readmissions, unnecessary treatments, and outpatient visits than any other type of adverse events (Zegers et al., 2011). Further, adverse events can also cause emotional distress among healthcare providers and negatively impact the overall healthcare system because of the increased utilization of resources (CIHI & CPSI, 2016). For example, supplementary care provided to patients attributed to adverse events are estimated to be \$685 million CAD in 2014-2015 (excluding physician fees and considering only the acute care costs) (CIHI & CPSI, 2016). Moreover, they are directly linked to the additional half a million days in hospital beds.

In the past decade, the fostering of IPC has been added to the educational curriculum (e.g., medical and nursing undergrad program), in clinical practice (e.g., various position statements on IPC practice), and specifically within the OR setting (e.g., surgical safety program, surgical safety checklist) (Canadian Nurses Association (CNA), 2020; Health Canada, 2012;

Health Ontario, 2010; Registered Nurses Association of Ontario (RNAO), 2013; World Health Organisation (WHO), 2010, 2021).

There is a significant relationship between the quality of IPC in the OR and patient safety and outcomes (CIHI, 2020; CIHI & CPSI, 2016; WHO, 2010). For example, improvements to IPC in the OR have resulted in significant reductions of surgical adverse events (Haynes et al., 2009; Mazzocco et al., 2009; Zegers et al., 2011). The IP OR team is composed of, at a minimum, three subteams (e.g., surgical, anesthesia, and nursing). The OR nursing subteam members often have a lower perception of IPC than either of the anesthesia and surgical subteams (Collette et al., 2017; Gillespie et al., 2013; Wauben et al., 2011). OR nurse perceptions have demonstrated that team skills (e.g., cognitive, social, and personal resource skills) of the IP OR team have an impact on the performance of perioperative nursing and patient safety (Holmes et al., 2020). When the mental models of all OR subteams are aligned, greater improvement of IPC and patient outcomes occurs (Nakarada-Kordic et al., 2016).

The nursing team is essential to the IPC in the OR. The unique knowledge and experience perioperative nurses provide towards improving the effectiveness of IPC is indispensable in the OR setting. Past research has focused mainly on the IPC OR team as a whole - few studies have investigated the impact of nurses to IPC in the OR. Therefore, the overall aim of this thesis was to explore the experiences of nurses contributing to IPC and to identify interventions used to facilitate IPC within the OR setting.

Literature Review

A literature review was conducted on IPC and IPC in the OR. An initial search of the grey literature, using both Google and Google Scholar to research the concept of interprofessional collaboration, generated over 4.75 million hits. A more focused search strategy was subsequently developed with the assistance of an academic librarian with a focus on interprofessional collaboration in the OR. The January 2015 to February 2020 Medline (via OVID) and CINAHL (via EBSCOHost) databases were queried using the key words: Interprofessional, Interprofessional Relations, Interdisciplinary, Multidisciplinary, Collaboration, Teamwork, and Operating Room. This generated 50 citations from CINAHL and 89 from MEDLINE. These materials provided a greater understanding of the IPC in both the healthcare and OR contexts.

The following describes IPC in healthcare, the influence of the IP team on collaboration in the OR, and the Interprofessional Education for Collaborative Patient-Centred Practice (IECPCP) framework.

IPC in Healthcare

IPC is a central clinical focus both in Canada and countries worldwide (Agency for Healthcare Research and Quality (AHRQ), 2021; Canadian Nurses Association (CNA), 2020; Health Canada, 2012; Health Council of Canada (HCC), 2005; Health Ontario, 2010; Healthcare Excellence Canada, 2021; Interprofessional Research (IPR) Global, 2019; Registered Nurses Association of Ontario (RNAO), 2013, 2016; Réseau de collaboration sur les pratiques interprofessionnelles en santé et services sociaux (RCPI), 2020; World Health Organisation (WHO), 2021). The concept of IPC in healthcare relating to patient safety and collaborative practice has been widely studied for the past 20 years (D'Amour et al., 2008; Dunn et al., 2007;

Espin et al., 2006; Goldman et al., 2009; Haynes et al., 2009; Leach et al., 2009; Lingard et al., 2002; Petri, 2010; Reeves et al., 2010; WHO, 2010; Xyrichis et al., 2018). There are multiple related concepts to IPC such as: collaboration, interdisciplinary, multidisciplinary, interprofessional, interprofessionality, and teamwork (Canadian Nurses Association (CNA), 2020; D'Amour & Oandasan, 2005; Health Canada, 2012; Health Ontario, 2010; IRP Global, 2019; Petri, 2010; Reeves et al., 2018; WHO, 2010). IPC in healthcare occurs when multiple healthcare workers from different professional backgrounds provide comprehensive services by working with patients, their families, carers, and communities to deliver the highest quality of care across settings (WHO, 2010). This is consistent with the Canadian definition of Interprofessionality according to the developer of the conceptual framework for Health Canada D'Amour and Oandasan, (2005).

Interprofessionality is defined as the development of a cohesive practice between professionals from different disciplines. It is the process by which professionals reflect on and develop ways of practicing that provides an integrated and cohesive answer to the needs of the client/family/population. (p. 9)

Interprofessional centres of expertise, in association with academic institutions, have emerged to promote, research, and educate healthcare professionals and organisations on interprofessional education and collaborative practice (e.g., University of Wisconsin-Madison USA Center for Interprofessional Practice and Education; Réseau de collaboration sur les pratiques interprofessionnelles en santé et services sociaux in collaboration with Laval University in Canada) (RCPI, 2020). Moreover, some hospitals in Canada have put in place initiatives to improve healthcare delivery, patient safety and outcomes by adopting healthcare models derived from IPC. For example, in 2006, The Ottawa Hospital (TOH) implemented the

Inter-Professional Model of Patient Care (TOH IPMPC[®], 2016) across hospital departments including the OR. The TOH IPMPC[®] is a set of principles created by patients and their healthcare providers to organize the delivery of patient care among health professionals from different disciplines, considering their competencies, collaborative patient-centered practice, and the hospital's strategic directions. The literature review also provided evidence on the applicability of the IPC within the OR setting.

Influence of the IPC in the OR

The OR is a complex environment based on patient acuity and the number of processes required during many high-risk procedures (Gillespie et al., 2010; Leach et al., 2009). The OR is also unique as the surgical procedures are often performed under intense time pressure as well as rapid changing and stressful circumstances within a sterile, small workspace (Holmes et al., 2020; Zegers et al., 2011). IP interactions among highly specialised and diverse groups of professionals are required (Leach et al., 2009). At a minimum, there are registered nurses, surgeons, and anesthetists. Depending on the type of hospital, however, the IP team may also include residents, students, and other allied professionals such as perfusionists or anesthesia assistants (Lingard et al., 2006).

There is a significant relationship between the quality of IPC in the OR and patient safety and outcomes (Zegers et al., 2011). For example, studies found that patients whose surgical teams exhibited less teamwork behaviors were at a higher risk of dying or experiencing complications (Mazzocco et al., 2009). The Healthcare professional's perceptions of IPC in the OR (e.g., communication, teamwork, situation awareness) also impact surgical patient safety and outcomes (Collette et al., 2017; Müller et al., 2018; Wauben et al., 2011). One study showed that

when team member roles and expectations of others are unclear, or when the hierarchy within the OR team is perceived to be illegitimate, tensions can emerge within the team and negatively affect its dynamics (Müller et al., 2018). The perception of teamwork quality in the OR varies by professional role (Müller et al., 2018; Sexton et al., 2006). Compared to surgeons and anesthetists, OR nurses believe there is less collaboration despite the close physical proximity of surgeons, anesthetists and nurses when working side by side (Collette et al., 2017; Makary et al., 2006; Sexton et al., 2006).

The research on effective collaboration among OR teams has mainly focused on communication skills with an emphasis on individual and organizational factors that affect communication in surgery (Wade, 2014). For example, one study demonstrated: (a) interdisciplinary diversity in OR teams contribute to complex interprofessional relations; (b) the organisation influences team cohesion; and (c) education is the panacea for improving team communication (Gillespie et al., 2010). Another study found that an OR team's optimal performance relied on open communication, clearly defined team expectations and promotion by the organization (Gillespie et al., 2013). Other research found that hierarchical structures, socialization of novices, gender, stereotyping, different professional priorities of patient care, and lack of familiarity within the IP team negatively impacted communication and teamwork within the OR (Espin et al., 2006; Gillespie et al., 2013; Haynes et al., 2011; Kang et al., 2015; Lingard et al., 2004). How people are managed, the existence of a shared definition of teamwork, clearly defined communication strategies, a feeling of familiarity within the team, the alignment of teamwork, the alignment of teamwork with professional role, and the positive display of emotions all facilitate IPC in the OR (Etherington et al., 2021). However, the presence of strong personalities, gender, hierarchies, a lack of knowledge in best practice, resource issues, a lack of

familiarity among team members, and the negative display of emotions erect barriers to the creation of IPC in the OR (Etherington et al., 2021).

Team communication can be improved with the use of IPC interventions (e.g., OR briefings) which can help to reduce the number of communication failures (Lingard et al., 2008). IPC interventions, such as team training (e.g., simulation training, Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) program), have also been shown to improve communication and teamwork. Together, they have a positive impact on patient safety and surgical mortality rates (Armour Forse et al., 2011; Hinde et al., 2016; Neily et al., 2010; Weaver et al., 2010). That said, more study is required to identify the effectiveness of specific aspects of IPC team structures and behaviors (D'Amour & Oandasan, 2005; Kennedy et al., 2019; Reeves et al., 2011; Zwarenstein et al., 2009). IPC interventions must continue to be researched with best practices implemented at all levels of care (e.g., micro, meso, and macro levels of care) (Bookey-Bassett et al., 2016; D'Amour & Oandasan, 2005; Reeves et al., 2017). It is important that, before establishing interventions and goals towards improving collaboration at a micro level (e.g., operating room, hematology clinic, inpatient medicine unit), additional information from the IP team (e.g., the people, processes and behavioural patterns) should be elicited to identify specific challenges unique to each setting and professional roles (Collette et al., 2017; Kennedy et al., 2019).

Less is known about IPC in the OR. Successful collaborative practice in the OR is influenced by a set of complex interactions between interpersonal, organizational, and systemic factors (Kennedy et al., 2019; Reeves et al., 2017; Wade, 2014). Being cognizant of how interpersonal factors may affect patient safety is an important first step to improve the quality of patient care (Lee & Doran, 2017). These findings revealed that achieving optimal teamwork in

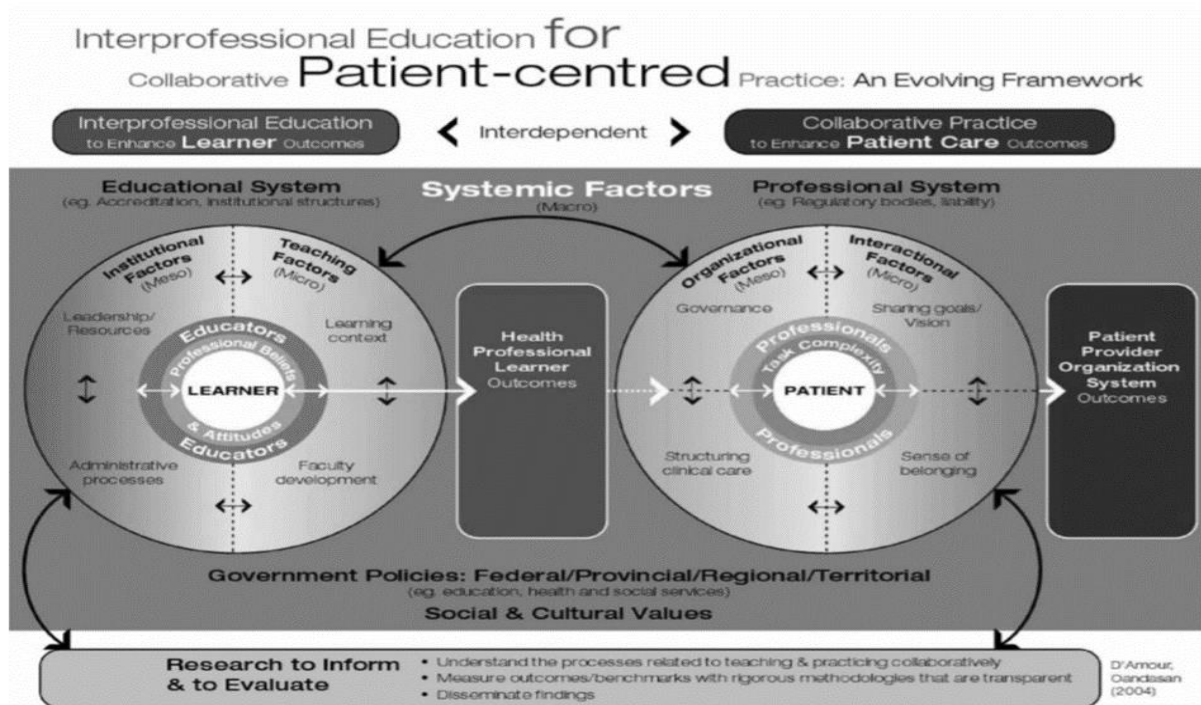
the OR requires more study with a focus on multi-level interventions addressing individual, team and systems-level factors (D'Amour et al., 2009; Etherington et al., 2021; IRP Global, 2019; Kennedy et al., 2019; Wauben et al., 2011; Zegers et al., 2011).

Interprofessional Collaboration Framework

A recent systematic review of qualitative research identified eight frameworks addressing IPC within healthcare organizations and compared them with seven interorganizational frameworks (Karam et al., 2018). Of these, only the Interprofessional Education for Collaborative Patient-Centred Practice (IECPCP) framework included both IPC and interorganizational concepts (D'Amour et al., 2008). Further, it is one of the most established for IPC in Canada and has international recognition (D'Amour & Oandasan, 2005; IRP Global, 2019; Oandasan et al., 2004). (see Figure 1.1)

Figure 1.1

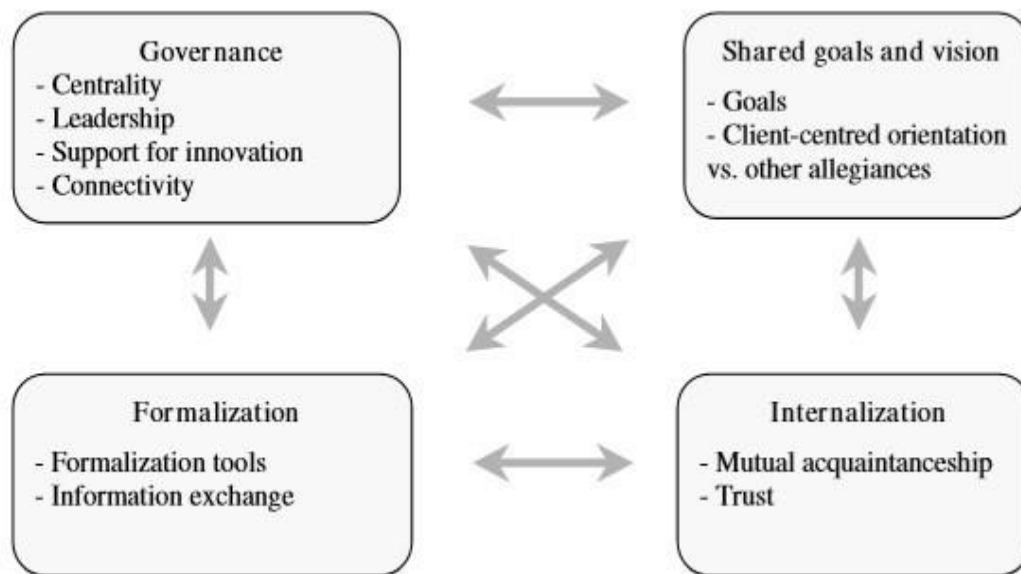
IECPCP Framework



The author used both the IECPCP framework developed by D'Amour and Oandasan (2005) and the revised terminology of concepts of D'Amour's Four-Dimensional Model of Collaboration (D'Amour et al., 2008) (see Figure 1.2) to examine the contribution of nurses in the OR.

Figure 1.2

Four-Dimensional Model of Collaboration



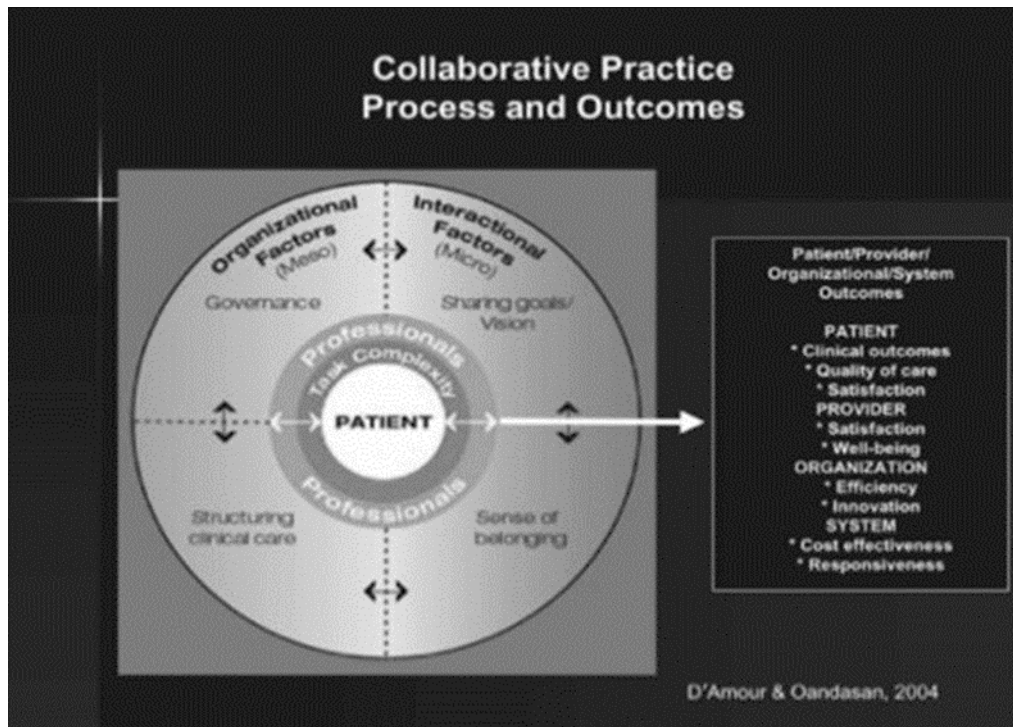
(D'Amour et al., 2008)

The following is a summary description of the systems-level factors of the IECPCP framework and precision which justified its use for this thesis (D'Amour & Oandasan, 2005). The IECPCP framework was derived from research conducted on behalf of Health Canada in 2004 and is designed to highlight the linkages between IP education and IP collaborative practice. It identifies the determinants and factors that influence educational programs that teach interprofessional practice, as well as the determinants and processes that influence the adoption of interprofessional practice within the healthcare system. It proposes two closely interlinked

systems of activity: (1) educational system: interprofessional education to enhance learner outcomes; and (2) professional system: collaborative practice to enhance patient outcomes. As the purpose of this thesis is directly linked to collaborative practice and patient outcomes, it was decided to focus on the determinants and factors of the professional system.

Collaborative Practice to Enhance Patient Outcomes

According to the IECPCP framework of D'Amour and Oandasan (2005), patient care outcomes are enhanced by processes and factors in collaborative practice settings (see Figure 1.3). This collaborative practice is influenced at three distinct three levels: (1) micro (interactional); (2) meso (organizational); and (3) macro (systemic). The patient is central to all collaborative processes. Therefore, the professionals and the patient are in an interdependent relationship. As patient outcomes are positively impacted through collaborative practice, this collective action can be analyzed in terms of interactional and organizational factors. There are four dimensions to collaborative processes, two of which are related to interactional factors and the remainder to organizational factors (D'Amour et al., 2008; D'Amour & Oandasan, 2005). The dimensions involving relationships between individuals have: (1) shared goals and vision (i.e., the existence of common or divergent goals among the healthcare teams); and (2) internalization (i.e., a sense of belonging, an awareness by healthcare professionals of their interdependencies and mutual trust). Those involving the organizational settings influencing collective actions: (1) are formalized (i.e., have systemic structuring of clinical care); and (2) have a governance structure in place (i.e., leadership that supports collaboration). These four interlinked dimensions are operationalized by ten validated indicators (D'Amour et al., 2008) (see Figure 1.2). Each indicator is associated with one of the four dimensions within the system of the collaborative practice to enhance patient outcomes (D'Amour et al., 2008).

Figure 1.3*IECPCP: Collaborative Practice to Enhance Patient Outcomes System**(D'Amour & Oandasan, 2005)*

The hypotheses of this framework are: (a) interprofessional practice cannot be developed only on the will of professionals or managers; (b) interprofessional collaboration involves continuous interaction between professionals and managers; (c) interprofessionality will be better understood through practice and research; and (d) healthcare provider satisfaction potentially improves teamwork, leading to enhanced patient outcomes (D'Amour & Oandasan, 2005).

The IECPCP concepts and framework are highly relevant to the IPC focus of this thesis. Of particular importance is the interlinkage of multi-level factors connecting IP collaborative practice and patient centred care to improve patient safety and outcomes (IRP Global, 2019; WHO, 2010). It has been validated and applied to several settings including those of acute and primary care (Collette et al., 2017; D'Amour et al., 2008; Toh et al., 2017; Wade, 2014). For

example, one study indicated that physicians perceived greater collaboration among team members than nurses. Nurse ratings on collaboration were the lowest in the OR. Strategies to improve collaboration must be fostered at the meso level by organisational leaders and customised to address micro level values (Collette et al., 2017).

Summary

In summary, the OR is a complex and unique environment that requires the expertise of a diverse group of professionals who must collaborate synergistically with good team dynamics in order to meet patients needs and avoid adverse surgical events (Gillespie et al., 2010; Holmes et al., 2020; Kennedy et al., 2019; Laflamme et al., 2019). When IPC is ineffective, higher rates of adverse surgical events occur (Haynes et al., 2009; Mazzocco et al., 2009; Schwendimann et al., 2018; Zegers et al., 2011). Nurses constitute an integral part of all IPC OR teams (Lingard et al., 2006). Nurse contributions towards IPC is critical. However, little is known about the nurse perspectives towards IPC in the OR for the improvement of patient safety and outcomes.

Positioning The Author

As a registered nurse of 24 years experience and a critical care military nurse of 17 years, the author has acquired experience in a variety of clinical contexts (e.g., emergency rooms, recovery rooms, intensive care units). Further, she has worked in hospitals, clinics, academic institutions, and zones of conflict. She sincerely believes the teams with whom she worked and trained were key to the quality of her education and the care she/they provided. The military provided interprofessional training in preparation for deployment. She has fostered interprofessional collaboration throughout the years and in more recent years have provided training. However, she has always maintained an interest in better understanding strategies to enhance interprofessional collaboration in the provision of high quality care.

Research Aim and Objectives

The overall aim of this research was to examine the contribution of nurses to IPC in the OR. In this first chapter, I have discussed the current evidence on IPC, IPC in the OR and the Canadian framework for IPC. This article-based thesis consists of two papers:

The first paper presented in (Chapter Two) is an interpretive descriptive qualitative study entitled, “Interprofessional Collaboration in the Operating Room: A Qualitative Study of Nurses’ Perspectives”. The specific objective was to explore the nurses' perspectives on their contribution to IPC in the OR.

The second paper presented in (Chapter Three) is entitled, “Interventions to Facilitate Interprofessional Collaboration in the Operating Room: A Scoping Review”. The specific objective was to identify IPC interventions involving operating room interprofessional teams and

determine their effects on facilitating communication within the IP team, teamwork, and safety outcomes.

Chapter Four provides an integrated discussion of the findings across these two papers. It discusses how these findings contribute to the role of nurses within IPC and provides implications for nursing practice, education, leadership and collaboration. Finally, it identifies areas requiring further research.

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Chapter Two

Interprofessional Collaboration in the Operating Room:

A Qualitative Study of Nurses' Perspectives

This chapter is based upon an unpublished manuscript formatted for submission to the journal

Association of periOperative Registered Nurses (AORN)

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Abstract

Interprofessional collaboration (IPC) in the operating room (OR) enhances safe and effective surgical care. The aim of this qualitative study was to explore the nurses' perspectives on their contributions to IPC in the OR. A secondary analysis of 19 semi-structured interviews with OR registered nurses was conducted. Inductive thematic analysis was completed with themes categorized into the Interprofessional Education for Collaborative Patient-Centred Practice framework. Nurses expressed the importance of being heard through effective communication (89%) and feeling confident in their role and being aware of interdependent roles (89%). Sharing a common understanding (79%) was an important factor for nurses. From nurses' perspectives, utilisation of structured processes (68%) enabled them to organize their care within the team. Nurses displayed leadership by anticipating needs of the team (53%). Nurses reported contributing to IPC through their shared understanding of common goals, their leadership within the OR, and their active involvement of delivering structured processes.

Keywords: Interprofessional, Interprofessional relations, Interdisciplinary Multidisciplinary, Collaboration, Teamwork, Operating room

Introduction

Over the last 10 years, there has been international emphasis on interprofessional collaboration (IPC) within healthcare especially in Canada (Canadian Institute for Health Information (CIHI) & Canadian Patient Safety Institute (CPSI), 2016; Canadian Nurses Association (CNA), 2020; Canadian Patient Safety Institute (CPSI), 2021; Health Canada, 2012; Health Ontario, 2010; Interprofessional Research (IPR) Global, 2019; World Health Organisation (WHO), 2010). IPC in healthcare is key for reducing adverse events and improving patient safety (CPSI, 2021; WHO, 2010). One of the healthcare settings that has the most frequent occurrence of adverse events is the operating room (OR) (Schwendimann et al., 2018). In Canada, in 2019-2020, 21% of adverse events were related to procedures such as surgery and 30% were infections including surgical infections (CIHI, 2020).

The OR has a unique set of team dynamics among the various disciplines that must work in close proximity within a high-risk environment (Catchpole et al., 2008; Gillespie et al., 2010; Holmes et al., 2020; Kennedy et al., 2019). When interprofessional (IP) teams exhibit less teamwork behaviors in the OR, the risk for death or complications increases (Lingard et al., 2004; Lingard et al., 2006; Mazzocco et al., 2009). Sixty-five percent of surgical adverse events (e.g., infections, bleeding) were found to be caused by human factor errors including ineffective IPC (Zegers et al., 2011). Furthermore, the perception of IPC in the OR can also have a direct impact on patient safety and outcomes (Müller et al., 2018). In fact, when the roles and expectations of each professional are unclear to one another or when the hierarchy within the OR team is perceived to be illegitimate, tensions within teams can emerge and negatively affect the processes and the teamwork (Gillespie et al., 2013; Wade, 2014).

As core members of all IPC OR teams, nurses, surgeons, and anesthetists directly influence the IPC dynamic in the OR (Catchpole et al., 2008; Lingard et al., 2006). Although OR nurses are known to rate IPC lower compared to other healthcare professionals within the IP team (Bowles et al., 2016; Collette et al., 2017; Makary et al., 2006; Müller et al., 2018), little is known about how they perceive their specific contributions to the IPC in the OR. IPC can directly contribute to promoting patient safety and outcomes, quality of work and work environment in the OR (Holmes et al., 2020).

Statement of Purpose

The overall aim of this qualitative study was to explore OR nurses' perspectives on their contribution to IPC in the OR.

Research Questions

Considering the nurse's role within an interprofessional team in the OR: (a) what are nurses' experiences about feeling a sense of belonging? (b) what are nurses' experiences about sharing common goals and a common vision? (c) what are nurses' experiences about the influence of governance? (d) what are nurses' experiences about how clinical care (formalization) is structured within the OR?

Statement of Significance to Nursing

The OR requires the expertise of a diverse group of professionals who must collaborate closely in synergistic team dynamics (Gillespie et al., 2010; Kennedy et al., 2019; Laflamme et al., 2019). Nurses are critical to the delivery of safe and effective care within the IPC team (Lingard et al., 2006). Surgical complications are higher when interprofessional collaboration is

ineffective (Mazzocco et al., 2009), and little is known on how nursing influences the IPC in the OR.

Conceptual Framework

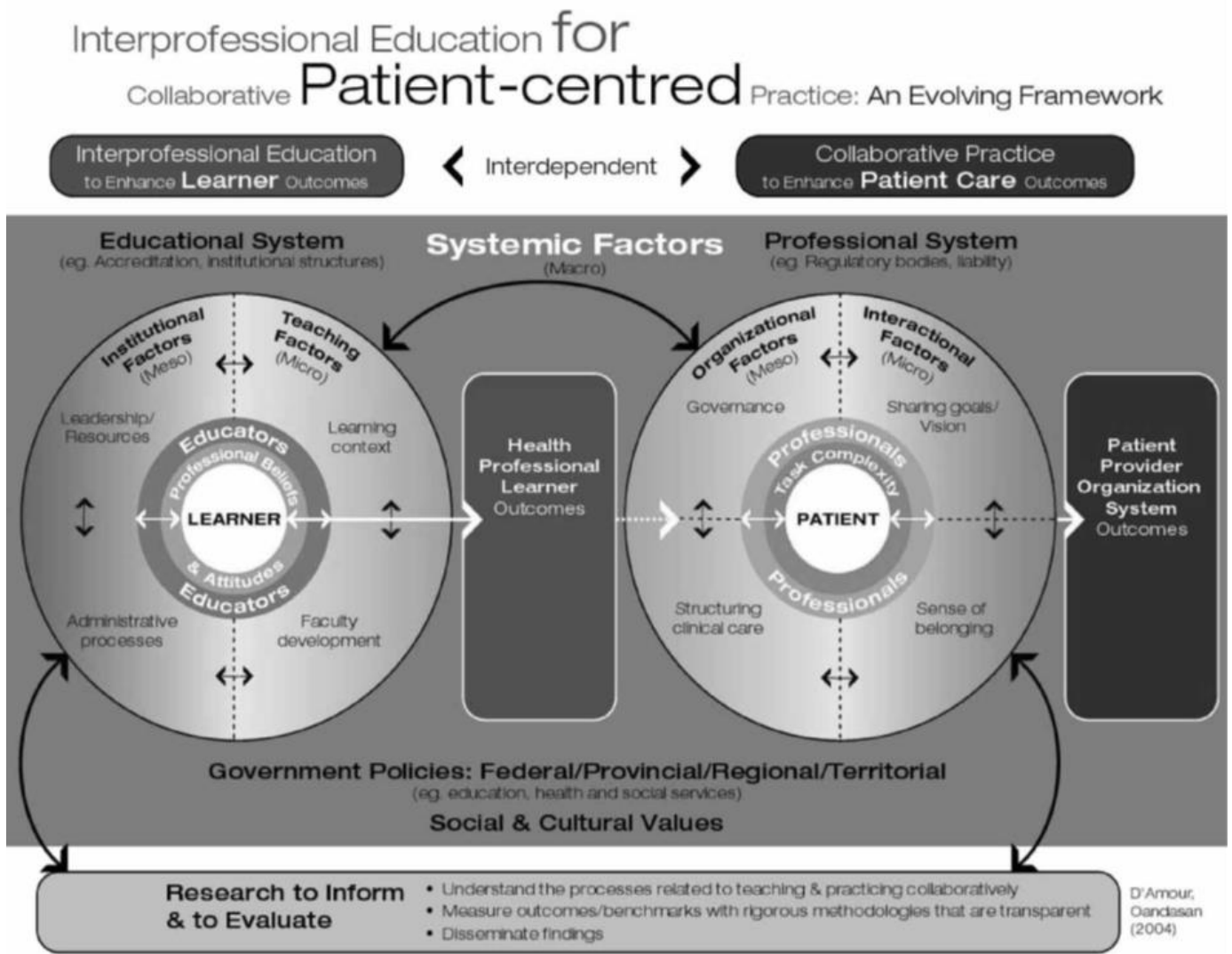
The Interprofessional Education for Collaborative Patient-centred Practice (IECPCP) framework was used to categorize qualitative themes identified to describe how nurses contribute to IPC in the OR (D'Amour & Oandasan, 2005). The IECPCP (see Figure 2.1) is a framework that identifies and defines the determinants and factors of two interlinked systems: (1) the educational system, and (2) the professional system. The professional system guides collaborative practice to enhance patient outcomes. Patients are the central focus of their healthcare and their outcomes are affected by the collaborative, interdisciplinary team processes. The determinants and processes are organised in three levels (1) macro level (systemic); (2) meso level (organizational factors); and (3) micro level (interactional factors). The micro and meso level elements of interdisciplinary collaborative patient centred practice are respectfully interactional and organizational. These levels are in a dynamic relationship influencing and informing each other. The macro is an overarching level with systemic structures influencing IECPCP. These include the educational (e.g., institutional structures) and professional (e.g., regulatory bodies) systems, as well as government policies (federal/provincial/regional) and social and cultural values. If IECPCP is to be promoted and fostered, collaboration between educators, practitioners, researchers, and policy-makers will be required. (see Figure 2.2).

Collaboration is determined by the task complexity requiring multiple professionals' knowledge and skills. The four dimensions of collaborative practice to enhance patient outcomes are: (1) sense of belonging (also referred as internalization), (2) shared goals and vision, (3)

structuring care (also referred as formalization), and (4) governance. Two of the dimensions involve the interactional factors at the micro level: (1) internalization defined as an awareness by

Figure 2.1

IECPCP Framework in Collaborative Practice



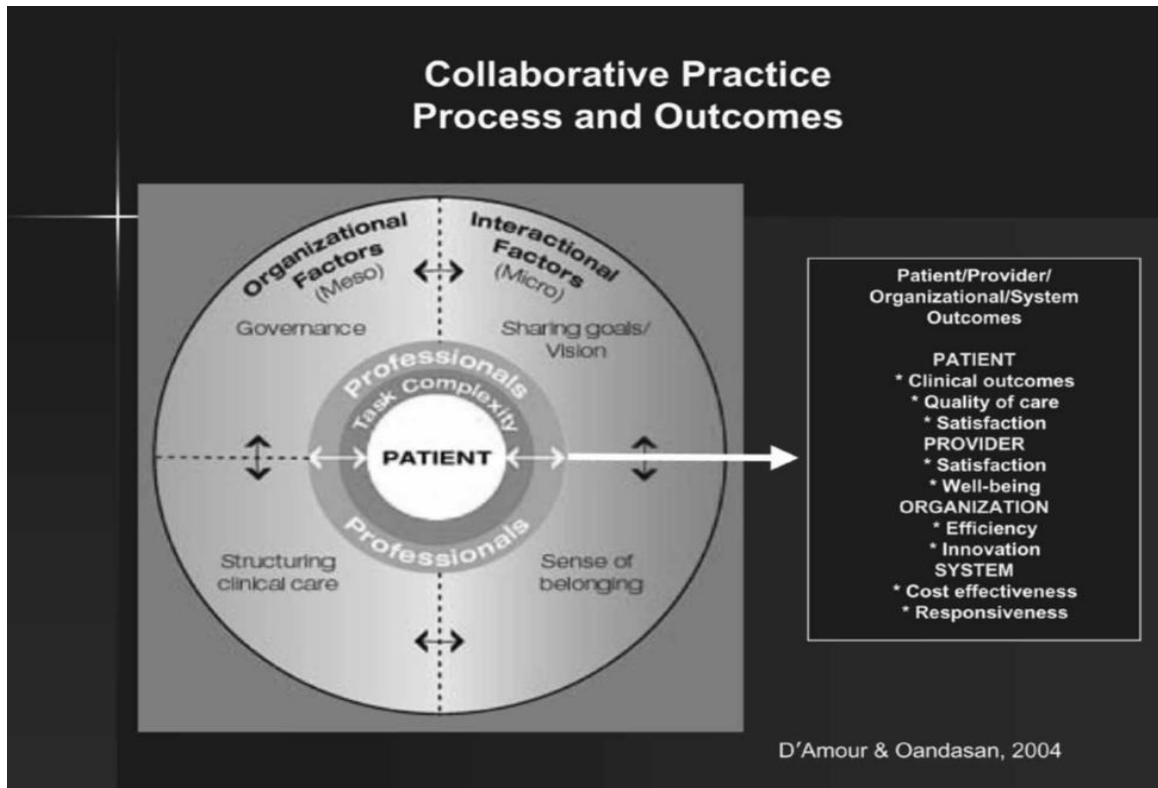
(D'Amour & Oandasan, 2005)

healthcare professionals of their interdependencies and mutual trust, and (2) shared goals and visions among the healthcare teams. The other two dimensions involve organizational factors at the meso level that influence collective actions: (3) formalization or the extent to which the procedures are documented, and (4) governance or leadership that supports collaboration. The

organizational setting is a key determinant of collaboration as are a number of organizational determinants that define the work environment (e.g., structure, philosophy, administrative support, communication, coordination mechanisms).

Figure 2.2

Four Dimensions of Collaborative Practice to Enhance Patient Outcomes



(D'Amour et Oandasan, 2005)

The micro factors are dependent on the interpersonal relationships between team members. The awareness by team members of these interactional factors (e.g., sense of bonding, willingness to work together) contributes to building a sense of mutual trust amongst health professionals working on the IP team. Therefore, there is a need to foster those collaborative

practice settings and assist practitioners in developing both competence and willingness to work collaboratively.

Operational Definitions

The concept of IPC has been extensively studied and there are multiple similar concepts used in the literature: collaboration, interdisciplinary, multidisciplinary, interprofessional, interprofessionality, and teamwork (CNA, 2020; D'Amour et al., 2009; Health Canada, 2012; Health Ontario, 2010; IRP Global, 2019; RNAO, 2013; RCPI, 2020; WHO, 2010). For the purpose of this study, interprofessional collaborative practice in healthcare occurs when multiple health workers from different professional backgrounds provide comprehensive services by working with patients, their families, carers and communities to deliver the highest quality of care across settings (WHO, 2010). This is consistent with the IECPCP framework (D'Amour et al., 2008; D'Amour & Oandasan, 2005).

Description of Study Design

The team conducted a qualitative secondary analysis of 19 semi-structured interviews with registered nurses in the OR. Interviews were selected from a multi-site qualitative study that aimed to determine barriers and enablers to effective teamwork using the Theoretical Domains Framework (TDF) (Etherington et al., 2021). For the purpose of this study, interview transcripts were analysed to specifically explore themes related to the contribution of OR nurses to IPC practice. This secondary analysis allowed our team to examine data with a different lens by focusing on nursing.

Although there are times when secondary analysis of qualitative data may not be appropriate (e.g., unrelated research question, extended period between original and secondary

analysis) (Thorne, 2012), it was well-suited for the current study for two main reasons. During data collection and analysis for the original study, it became apparent that nurse knowledge was an important factor in shaping teamwork experiences in the OR (Etherington et al., 2021). This helped to formulate the research questions for the secondary analysis reported in this manuscript. It rendered the secondary topic closely aligned to the first, as these questions represent an important aspect of the primary phenomenon (OR teamwork) that was originally studied. Furthermore, this secondary analysis extended the original study to recognize and further explore the contribution of nurses in the OR, using an established relevant cohort of participants, and more importantly, mapped findings onto the IPC professional practice part of the IECPCP framework (D'Amour & Oandasan, 2005).

Setting

The original study was conducted across six sites. One academic hospital located in Toronto, Canada, had 463 acute adult inpatient beds and employed 1,644 nurses, with an average of 29,000 surgeries per year. Three academic hospitals were located in Ottawa, Canada, one of which had three campuses including 1,271 beds, employing 4,595 nurses with an average of 67,119 surgeries per year. Another was a pediatric healthcare and research centre that had 167 beds, employing 679 nurses with an average of 7,700 surgeries per year. Lastly, a cardiovascular health centre that had 136 beds, employing over 600 nurses and had on average 1,700 surgeries per year (Etherington et al., 2021).

Sample and Sampling Technique

For the original study, all healthcare professionals working in the OR were eligible to participate; there were over 1000 such individuals across the six primary recruitment sites

(Etherington et al., 2021). Healthcare professionals not part of the OR team at these or referred sites were not eligible to participate. In the original study, purposive and snowball sampling were conducted until saturation was reached. There were 66 healthcare professionals interviewed of which 21 were OR nurses.

Of the 21 interviews with nurses, 19 were registered nurses and two were registered practical nurses. Registered practical nurses were excluded given they have a different scope of practice compared to registered nurses in Canada.

Description of Procedures for Protection of Participants

After obtaining written or verbal informed consent, all interviews were audio-recorded, transcribed, de-identified and deleted following transcription. Approval to conduct this secondary analysis was obtained from the University of Ottawa, Office of Research, and Integrity (H-11-20-6275) and from the Ottawa Hospital Research Institute Ethics Board (20200626-01H).

Description of Study Procedures

In the original study, nurses were interviewed in English by one of two research team members in person or over the telephone (Etherington et al., 2021). Each interview lasted approximately one hour and used a semi-structured interview guide based on a modified version of the Theoretical Domains Framework (Atkins et al., 2017; Cane et al., 2012). The TDF is a validated framework for ascertaining barriers and facilitators to behaviour change among healthcare professionals.

Data Analysis and Interpretation

An interpretive descriptive qualitative approach directed the analysis of the nursing experience as part of the IP team in the OR (St George, 2010; Thorne, 2008). The qualitative approach was chosen to gain an understanding of a phenomenon that facilitated knowledge development to inform clinical practice (Thorne, 2008).

The interview transcripts were subjected to thematic analysis which involved the identification of commonalities and differences in qualitative data, thereby, seeking to draw descriptive and/or explanatory conclusions clustered around themes (Gale et al., 2013; Neergaard et al., 2009). Following the principles of Interpretive Description (Thorne, 2008), the thematic analysis was conducted by three team members (MJL, DS, NE) in five stages. In Stage 1, the de-identified transcriptions were read once to determine themes that emerge inductively from an ‘aerial view’ of the data. In Stage 2, all transcripts were transferred to NVivo (version 12; QSR International Pty Ltd, 2018) to aid the analysis of the data. In Stage 3, three transcripts were initially analyzed line by line for themes reflecting the IPC contributions of nurses by two researchers independently (MJL, DS). The remaining 16 transcripts were analyzed line by line by one researcher (MJL). Employing the Interpretive Description approach (Thorne, 2008), themes were first subject to broad inclusion so as not to restrict the validity of the data due to premature categorization. As further interviews were analyzed, responses were grouped first into sub-themes, with those eventually being clustered under applicable broad themes. In Stage 4, the themes were categorized using the four dimensions of collaborative practice within the IECPCP framework (D'Amour & Oandasan, 2005). Lastly, in Stage 5, themes and their categorisation were audited by two researchers (DS, NE). The demographic data were summarized descriptively.

Results

Characteristics of Participants

The 19 interviews were conducted during the period January to April 2019. All participants were working as scrub or circulating registered nurses in the OR (see Table 2.1). Participants self-identified as women (79%) or men (21%). Participants' ages ranged from 24 to 51 years (Mdn=32, SD=8.3) and their experience working as registered nurses ranged from 2 to 23 years (Mdn=8, SD=6.2).

Table 2.1

Characteristics of Participants

Characteristics	Participants N=19 (%)
Professional role	
Registered Nurse	19 (100%)
Age (years)	
20-30	7 (37%)
31-40	7 (37%)
Over 41	5 (26%)
Gender	
Women	15 (79%)
Men	4 (21%)
Ethnicity/Race	
Caucasian	10 (53%)
Non-Caucasian (i.e., Asian, Black)	5 (26%)
Unknown	4 (21%)
Nursing Experience (years)	
0-5	4 (21%)
6-10	8 (42%)
11-15	2 (11%)
16-20	4 (21%)
Over 21	1 (5%)

Emerging Themes

The 20 themes that emerged are narratively described with themes underlined in italics. Based on collaborative practice to enhance patient care outcomes of the IECPCP framework (D'Amour & Oandasan, 2005), eight themes were categorized under internalization, four themes for shared goals and vision, five themes for governance and three themes for formalization (see Figure 2.3).

Themes for Internalization

There were eight themes categorized within internalization (Figure 2.3). Internalization refers to the bonds that develop between team members and their willingness to work together (D'Amour & Oandasan, 2005). It implies the awareness and interdependency of professionals, that translates into a sense of belonging, mutual knowledge of values and disciplinary frameworks, and trusting relationships.

Of 19 nurses, 17 nurses expressed the importance of being heard through effective communication to ensure good teamwork and outcomes. For example, *“I find most of the time the nurses are always trying to scream to be heard because we feel like what we have to say is also important; but most of the time surgeons do not acknowledge that”* (participant 02). Another nurse said, *“When you have good teamwork and communication, you both are excelling at what you are doing, and when the communication is poor, it is very repetitive, because you become unsure if that person’s done it....it makes cases longer”* (participant 06).

Seventeen nurses strongly believed that feeling confident in their role and aware of interdependent roles was essential to achieve effective teamwork.

For example, *“We all know what our role is, then I think it just makes things go so much easier and build confidence for everyone, and make sure that we have a positive outcome”* (participant 14). Another nurse said, *“Cause nobody in the OR can do their job without anybody else. Surgery cannot do their job without anesthesia. Anesthesia cannot do their job without nursing. And surgery cannot do their job without nursing as well”* (participant 08).

Sixteen nurses shared the crucial worth of being mindful of the environment to ensure situation awareness and emotions which can greatly influence the team dynamics and affect patient safety. For example, *“You need to have surgical conscience... sometimes surgeons don’t notice, (e.g., their scrub cap brushed the light handle cover) but the nurse notices...and advocates for the patient’s safety...the nursing role, to see the bigger picture, especially as a circulating nurse”* (participant 10). Another nurse said, *“Sometimes when anesthesia or the surgeon start to get really stressed; they start not asking for things properly...you just have to kind of remember that they are not mad at you, they are kind of mad at the situation usually”* (participant 01).

Fourteen nurses stated that *feeling respected* is crucial to promote good teamwork. For example, *“I find that the tone and the language sometimes used by people can be condescending or insulting, courteousness is respect for the people in the room so that things get done and timelines are met”* (participant 08). Another said, *“If you have good teamwork then that would mean you work collaboratively which means your opinion’s respected amongst the other people that you are working with”* (participant 20).

Thirteen nurses brought forward the importance of *feeling comfortable to speak up* to foster efficient teamwork. For example, *“I do not mind speaking up whereas like the new nurses, they do not feel as comfortable. But I literally just yell out, Listen, we are doing this for the safety”*

of the patient” (participant 05). Another nurse said, “A lot of nurses are afraid to respond back or ask again... it just depends on everyone’s personality. If the surgeon is yelling at you, you do not want to talk to them...” (participant 02).

Eleven nurses communicated that a sense of inclusion and connection contributes to better teamwork. For example, *“Inclusiveness... you will see surgeons and anesthetists talking and they forget that nursing even exists, and they need the nurses to help them achieve it” (participant 08). Another nurse said, “I think it would be helpful to get to know some of our interprofessional team members; even like our lunchrooms are segregated” (participant 13).*

Ten nurses identified that a sense of trust is required to strengthen teamwork and help build confidence in the team. For example, *“I find having that bond strengthened by challenges, helps to kind of build confidence in each other and then that, conversely, helps build the team and trust” (participant 09). Another nurse mentioned, “I think a lot of it has to do with how you are in trusting the other person’s actions and trusting that they are fulfilling the requirements” (participant 06).*

Six nurses described a sense of cohesion is important for teamwork. For example, *“It does not matter how good you are as a professional, you need to be able to work with the other team members” (participant 17). Another said, “If somebody is more domineering, you can become apprehensive to sort of question things. Some people are just very strong-willed, and it is just not good teamwork” (participant 06).*

Themes for Achieving Shared Goals and Vision

Four themes were about having shared goals and vision (see Figure 2.3): These were defined as the existence of common aims and their appropriation by the team, the recognition of

divergence that helps create allegiances, and the diversity of definitions and expectations regarding collaboration (D'Amour & Oandasan, 2005).

Of 19 nurses, 15 identified the critical requirement to share a common understanding and for all professions within the OR team to ultimately contribute to the same purpose. For example, *“In the OR it is important to be able to talk to interprofessional teams so that you are on the same page. We come from different backgrounds, and - have the same goal which is to treat the patient”* (participant 13). Another nurse observed, *“If nursing, anesthesia and the surgeons work as separate teams, nothing would flow through the day, no one would really get what they need. The patient would have three different care plans instead of everyone working as a team”* (participant 01).

Nine nurses disclosed that when goals are aligned satisfaction emerges which impacts positively upon teamwork. One nurse said, *“I think everyone has a better attitude when everyone is working together and feels better about their day and better about their job”* (participant 01). Another nurse stated, *“My day is good when everything goes smoothly. And it goes smoothly because everybody is working together, talking, and getting everything done”* (participant 09).

Five nurses described their role in keeping the patient central in the shared goal of the IP team. For example, *“We are just here for the patient, so if we can work in a team setting to make sure that things run smoothly for the patient’s surgery and the patient to have the best outcome”* (participant 02). Another nurse said, *“be proactive and be able to advocate for the patient’s safety, I think that really helps”* (participant 10).

Four nurses reported that to obtain a common vision it is necessary to share expectations. For example, *“Different definitions, different knowledge can build on how the team can grow and work together but if there is no communication on what other people’s expectations are or*

definitions, then it can be a hinderance” (participant 03). And another nurse said, “Everybody requires something different...open up on their needs or what they expect from you and what they’re trying to achieve” (participant 19).

Themes for Governance

Five themes emerged within governance (see Figure 2.3). Governance refers to professionals focusing on central and local leadership, expertise, and connectivity (D'Amour & Oandasan, 2005).

Of 19 nurses, 10 displayed nursing leadership qualities by anticipating needs of the team as an integral part of their role for improving teamwork. One nurse said, *“I know what cases we are about to do. That way I can anticipate what the needs of the room are, like the supplies, check the anesthesia cart and make sure everything is within reach” (participant 10). Another stated, “The nurses must prompt. Like we must go up and ask the surgeons. Say, ‘Is this what you need, we want to verify, this is what we have in the room” (participant 2).*

Seven nurses reinforced the need for management to provide support to build team connectivity amongst the OR nurses and the OR team. For example, *“I think it is important for management to give a little bit more to the nurses...like, kudos and being more open with staff. Because right now I think that management and the nursing staff are very far apart” (participant 17). Another nurse said, “I feel management can certainly improve on keeping us together and maybe boosting morale through team building exercises” (participant 13).*

Six nurses discussed the competing roles of leader and trainer for OR nurses responsible for the integration of new OR nurses into the IP team. For example, *“When we are training staff, it is hands-on. ...you are expected to run your room as you would in a normal day with no extra time... when you are giving care, you are expected to be teaching as well” (participant 04).*

Another said “*I find that sometimes you are more focused on teaching than you are on what is going on in the room. So, sometimes teamwork might drop just because you are focused on training*” (participant 08).

Five nurses reported that OR team members need to have alternating leadership among OR team members. For example, “ [the OR team requires] *somebody who will work as a team member and know when to be more directive when the situation calls for it, more of a leader*” (participant 3). Another nurse said, “ *Some members are just great at engaging and leading teamwork. And if they are not good leaders, it can be hard to work as a team*” (participant 14).

One nurse explained that the scheduling structure inhibits novice nurses from becoming leaders by not providing consistent shifts in an OR environment that allows junior nurses to build their knowledge and expertise. She said, “*They [management] say their goal is not to create expert nurses but just to create a huge floating pool. And so, now we have a lot of junior nurses who... take longer for them to develop these [leadership] skills*” (participant 04).

Themes Supporting Formalization

Three themes were identified within formalization (see Figure 2.3). According to IECPCP, formalization refers to the structure in clinical care, established rules, or tools to facilitate information exchange and aimed to regulate actions (D'Amour & Oandasan, 2005).

Of 19 nurses, 13 identified the value of using a structured process for the team. This included the use of pre-surgery and post-surgery briefings, and strategic pauses during surgery. These tools were essential to best assist planning and improve teamwork for each surgical case. For example, “*Briefing with the whole surgical team present...name, allergies, demographic history, what the plan is, what the procedure is, which leg it is, or which arm, make sure we are*

on the right side” (participant 02). Another nurse mentioned, “Everybody needs to know the plan and especially if it is a critical patient. The surgical team needs to communicate what troubles we could be running into and things that are unforeseen” (participant 19).

Five nurses reported the importance of gaining new knowledge as a team. For example, *“Wednesday, we have a weekly in-service, and it varies in topic. Some are about anesthesia, some are about special surgeries or equipment, and I find that those really help just to bring everyone together” (participant 17). Another nurse proposed a formalised way to promote gaining knowledge as a team by saying, “It takes practice and I think that we need like a simulation lab, an environment where people are cautiously told what you need to communicate to the nurse...Like people need to be taught [as a team]” (participant 02).*

Two nurses described a process for flagging and preventing unfavorable behaviors to help healthcare providers denunciate and minimize negative behaviors (e.g., harassment, violence, aggression) impeding the dynamics of the team. For example, *“We have a blue form, so you can blue form any employee, any staff, which means, it is a warning, any type of harassment or violence, or aggression, and it is done anonymously” (participant 02). To reduce negative behaviors, another nurse said, “There is a black box...if they think they are [surgeons] being watched, that is one incentive” [to prevent bad behaviours] (participant 05).*

Discussion

The aim of this secondary analysis was to explore nurses' perspectives on their contribution to IPC in the OR. Overall, the nursing experience emerged across the four dimensions of collaborative practice to enhance patient care outcomes within the IECPCP framework. These results led to three observations.

Nurses Feeling Part of the Team

Nurses feel part of the IPC team when this emotion is internalized. They maintain that being heard, respected, included, and connected creates a sense of trust. When they sensed they were a trusted member of the team, they were comfortable expressing concerns and observations and confident in their role. This resulted in better cohesion, mindfulness towards the team, and ultimately improved teamwork. These findings align with previous research showing that communication effectiveness increased in networks in which clinicians reported interacting frequently, having close working relationships, socializing, and seeking advice and providing advice to others (Gillespie et al., 2013; Stucky et al., 2020).

Further, barriers to nurses internalizing their role within the IPC were affected by unfavorable behaviours (e.g., harassment, violence, aggression) or acting out behaviours (e.g., yelling, being in a bad mood, disregarding others) (Booij, 2007; Etherington et al., 2021; Wauben et al., 2011). The OR is a complex and high intensity environment where ineffective behaviours impede IPC and negatively affect the delivery of care (Lingard et al., 2004; Mazzocco et al., 2009). Measures to prevent and flag these behaviours (e.g., unanimous reporting mechanisms, black box recordings) were helpful to promote healthy work environments for nurses to thrive and not impede delivery of patient care.

Prevalence of Nurse Advocacy Role

The second observation involved nurse contribution(s) to shared goals and vision to facilitate safer care delivery. Nurses frequently mentioned advocating for a patient-centred shared goal, which is particularly important when patients are not able to speak up for themselves during surgery. Our findings are congruent with nursing guidelines recommending that nurses initiate collaborative processes to improve patient outcomes; in particular, when the

acuity of the patient is increasing (RNAO, 2013, 2016). Nurses also reported fostering a preventive and protective environment within the OR in support of improved patient safety as well as safety for members of the IPC team. Previous research has shown that when effective teamwork in the OR team is applied, it enables nurses to contribute to avoiding negative consequences for patients (Holmes et al., 2020).

Nursing Leadership and Need of Support

The third observation described a desire to provide leadership within the OR but perceived a lack of support at the organizational level to accomplish this aim. Nursing leadership in the OR is supported by findings indicating that good intraoperative nursing leadership is important for avoiding some procedural problems and errors (Catchpole et al., 2008). Nurses in our study described the need for a team member to take charge and lead the OR team. They believed the circulating nurse was in a good position to assume leadership in some situations as she/he was consistent throughout the OR procedure in having the most situational awareness and sense of ensuring holistic care. Often this was done by anticipating the needs of the team within IPC. It is consistent with another study of OR nurses describing 72-76% of their OR time observing and anticipating, and for the remaining of the time, performing anticipatory movements (Zheng et al., 2009). Further, nurses in our study felt they needed more support to build connectivity within the IP team (micro level) and that some of the management practices (meso level) can interfere with the development of nursing competencies (e.g., rotating nursing staff). This was supported by another study reinforcing that OR nurse preparedness (ability to react to anticipate needs) can be attributed to experience and familiarity with the team which directly impacts operating time and patient safety (Holmes et al., 2020). Nurses in our study reported that it was difficult to achieve connectivity when they are scheduled to float between

OR rooms and are not permitted to build experience and relationships within specific teams. It is noteworthy that being provided opportunities or spaces to promote development of familiarity, circumstances to alleviate the added responsibilities when training and adopting structures that will help develop expertise for novice nurses, all contribute to nurses anticipating the needs of the OR team.

Nurses who were interviewed described meso level pressures from the added responsibilities of providing training to new staff while concurrently performing their nursing assigned role in the OR. This lack of support for these added responsibilities increased nurse stress and dissatisfaction, thereby impeding nursing care, contribution to IPC and patient safety (Lee et al., 2020; Makary et al., 2006). However, participants reported that junior nurses from the float pool were less likely to be able to take on a leadership role in the OR, given their limited trusting relationships with others on the IPC team. Nursing leadership is an important skill that also needs to be supported and developed as new nurses move from abstract to concrete experiences (Altmann, 2007; Benner, 1984; Titzer et al., 2014).

The use of structured processes to guide the IP team (e.g., checklists, briefing) helped improve communication within the team and operationalize the authenticity of a nurse leadership role. The checklist has proven its worth in helping IP team members focus on the routine tasks, trigger communication, and improve patient safety (Halverson et al., 2009; Reeves et al., 2010).

Strengths and Limitation

Specific methods were used to enhanced credibility and transferability of the findings (Lincoln & Guba, 1986). Credibility of the findings was strengthened through data analysis that was initially conducted independently by two team members (MJL, DS), then completed by one team member (MJL), and audited by two other team members (DS, NE). Transferability was

enhanced by describing the context of the study in detail so that readers could determine the degree of fit or similarity with other setting.

A limitation of a secondary analysis is the lack of oversight and quality of the data collection process (Ruggiano & Perry, 2019; Thorne, 2008). These concerns were minimized because the original study employed a sound and rigorous methodology and framework. Further, the primary author took part in the secondary analysis study (Etherington et al., 2021). This helped maintain effective representation of the perspective of the participants (fidelity of the data) (Thorne, 2012).

Conclusion

Registered nurses are indispensable members of OR IPC teams and their contribution is undeniably important to improving IPC. They need to feel part of the IP team and share a common understanding with all members of the IP team. Nurses also need support from the organisation to enact their leadership role on the team and this can be facilitated by use of structured processes. These critical elements of IPC practice optimally contribute to enhance patient safety and outcomes. Efforts to extend awareness towards ways to improve and support nurses' contributions to the IPC team should be the focus of future research in order to provide evidence-based strategies for continued quality improvement.

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Chapter Three

Interventions to Facilitate Interprofessional Collaboration in the Operating Room:

A Scoping Review

This chapter is based upon an unpublished manuscript formatted for submission to the journal
Operative Room Nurses Association of Canada (ORNAC)

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Abstract

Background:

Surgical adverse events are more preventable and their consequences are more severe than other types of adverse events. Ineffective interprofessional collaboration (IPC) can increase the occurrence of adverse events in the operating room (OR). When professionals work together in IPC, they are more likely to improve patient safety and outcomes.

Aim:

The aim of this scoping review was to identify IPC interventions involving operating room interprofessional teams and determine their effect on facilitating communication within the IP team, teamwork, and safety outcomes.

Methods:

A scoping review was conducted using the Arksey & O'Malley's framework. A database search was undertaken in Medline, CINAHL, PsycINFO, and Embase. Eligible studies were quantitative studies evaluating an intervention for use in the OR to enhance IPC. Screening and data extraction were conducted by two authors independently. Results were analysed by identifying the IPC interventions and mapping their related outcomes into three IPC outcomes categories: (a) communication, (b) teamwork, and (c) safety. Findings were presented in accordance with the PRISMA-ScR guidelines.

Results:

Of 1840 studies screened, 20 studies evaluated single or multi-faceted IPC interventions. Study designs were: (a) non-randomized with a controlled group including interrupted time series analysis, (b) pre-post, and (c) post only using observations and surveys. Despite use of low

quality study designs, the IPC interventions (e.g., briefing, checklist, team training, debriefing) improved communication and teamwork among IPC team members and enhanced safety outcomes. Only one study using team training reported on organisational level interventions (e.g., Standard Operating Procedures, Lean quality improvement management system) improving teamwork and safety outcomes.

Conclusion:

There were four interventions to enhance IPC within OR teams. Although findings were in favour of improved communication and teamwork within the team, more rigorous research is required.

Keywords: Interprofessional, Collaboration, Teamwork, Operating room, Nursing.

Introduction

Healthcare systems are constantly seeking efficient and effective ways to better serve clients and address professionals' needs (World Health Organisation (WHO), 2009). When professionals work together in interprofessional collaboration (IPC), they are more likely to respect one another's perspectives in healthcare and help improve patient safety and outcomes (WHO, 2010). Ineffective IPC can have adverse effects on healthcare especially in the operating room (OR) (Mazzocco et al., 2009; Müller et al., 2018; Schwendimann et al., 2018; Zegers et al., 2011). In fact, surgical adverse events are occurring more often, are preventable and their consequences are more severe compared to other types of adverse events (Schwendimann et al., 2018; Zegers et al., 2011).

IPC practice occurs when multiple healthcare workers of different professions provide comprehensive services to patients, their families, carers, and communities (WHO, 2010). The IECPCP framework is a structural model of collaboration, which applies to interprofessional and interorganizational collaboration in healthcare (D'Amour et al., 2008; D'Amour & Oandasan, 2005). The IECPCP has 3 levels of factors (micro, meso, and macro) including four interrelated core dimensions within the professional system (internalisation, shared goals and vision, governance, and formalization). To improve IPC at all levels a variety of IPC interventions have been used (Reeves et al., 2011; Reeves et al., 2018; WHO, 2010; 2021). In Canada, Health Canada sponsored the development of IECPCP framework to facilitate and support the implementation of an approach to interprofessional education for collaborative patient-centred practice across healthcare sectors (Oandasan et al., 2004).

An IPC intervention involves members of more than one health and/or social care profession interacting together with the explicit purpose of improving interprofessional

collaboration (Zwarenstein et al., 2009). A Cochrane systematic review of practice-based IPC interventions within healthcare conducted in the United States of America, Australia, United Kingdom, Belgium, and Sweden identified nine individual and cluster randomized controlled trials that covered four types of practice-based IPC interventions: (a) externally facilitated interprofessional activities, (b) interprofessional rounds, (c) interprofessional meetings, and (d) interprofessional checklists. These studies showed low and very low level of certainty of evidence (Reeves et al., 2017). Out of the nine, only one was conducted in the OR setting (Calland et al., 2011). This study evaluated a checklist constructed from a literature review of surgical practices and with consensus of two surgeons. The findings from this surgeon-focused checklist provided no improvement on patient safety and little improvement on IPC (e.g., situational awareness did not significantly differ) within the OR teams (Calland et al., 2011). Hence, no study evaluated IPC interventions for IP teams in the OR.

Aim

The aim of this scoping review was to identify IPC interventions involving OR interprofessional teams and determine their effect on facilitating communication within the IP team, teamwork, and safety outcomes.

Methods

Study Design

The authors conducted a scoping review guided by the Arksey and O'Malley (2005) framework. This type of review provided clarity to an area of research that is nebulous in nature. It proved valuable when summarizing the findings for a broad range of users (e.g., policy makers, healthcare professionals) and identifying research gaps (Arksey & O'Malley, 2005). It was conducted in five stages: (a) identifying the research question, (b) identifying relevant studies, (c) selecting relevant studies, (d) data charting, and (e) collating, summarizing, and reporting of study results.

a) Identifying the Research Questions

The research questions are: (a) What are the types of interventions used to improve IPC in the OR? (b) What IPC interventions are more likely to be used by healthcare professionals in the OR? and (c) What is the effect of IPC interventions in the OR on communication, teamwork, and safety outcomes?

b) Selecting Relevant Studies

SPIDER (Sample, Phenomenon of Interest, Design, Evaluation, Research type) (Cooke et al., 2012) (see Table 3.1) was used to determine the eligibility of studies to be included in this research. This tool provides a structure for searching that appears to have a greater level specificity (Cooke et al., 2012; Methley et al., 2014). Sample (S): IPC team including at a minimum nurses, surgeons, and anesthesiologists. Phenomenon of Interest (PI): interventions to facilitate IPC within the OR setting and excluding all non-OR related environments. Design (D): interventions evaluated using randomized controlled trials, pre and post, observational, and

interrupted time series. Qualitative studies, theses, dissertations, quality improvement articles, editorials, and conference abstracts were excluded. Evaluation (E): outcomes to measure the effect of the IPC interventions on communication, teamwork, and safety outcomes. Research type (R): mixed methods and quantitative studies. Excluded were qualitative studies such as ethnographic phenomenology and grounded theory.

Information Sources. The following data databases were searched: Medline (via OVID), CINAHL (via EBSCOHost), PsycINFO (via OVID), and Embase (via OVID). The period of interest was January 1, 2005 to November 6, 2020. The start date of 2005 reflects the date the Interprofessional Education for Collaborative Patient-centred Practice (IECPCP) framework for Health Canada was published.

Table 3.1

Inclusion and Exclusion Criteria for Search Strategy Tool SPIDER

SPIDER	Inclusion criteria	Exclusion criteria
Sample	Nurses, surgeons, and anesthetists	Nurses only, physicians and anesthetist only
Phenomenon of Interest	Interprofessional collaboration /Teamwork in the operating room	Non OR environment
Design	Studies evaluating interventions using randomized controlled trials, pre-post, observational, and interrupted time series	Thesis, dissertations, quality improvement articles, editorials, and conference abstracts
Evaluation	Outcomes to measure the effect of the IPC interventions	
Research type	Quantitative and mixed methods	Qualitative research (e.g., ethnographic, phenomenological, grounded theory)
Language	All languages that can be translated	

Search Strategy. With the assistance of an experienced research librarian (LS), the research team designed the search strategy for the four electronic databases. The following subject headings and keywords were used: Interprofessional, Interprofessional relations,

Interdisciplinary, Multidisciplinary, Collaboration, Teamwork, Operating room, Nursing. Their relevant terms from each database were searched. The searches strategies were performed by MJL and validated by LS (see Appendix C). No other publication restrictions were added.

c) Selecting Relevant Studies

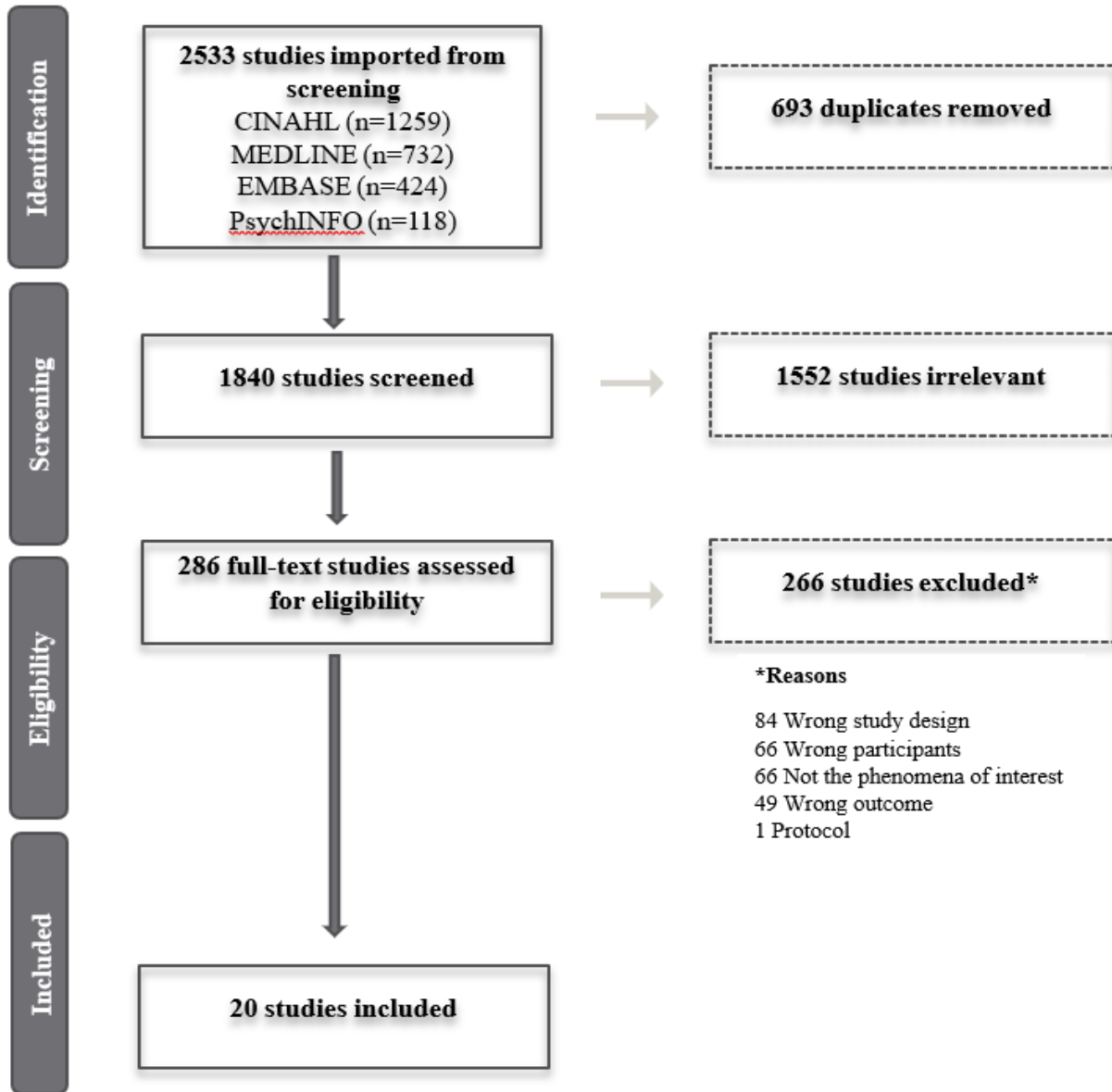
All identified citations were uploaded into Zotero (5.0) reference management system (Rosenzweig, 2018). The search findings were then exported into Covidence software (Covidence, 2020), an online tool that facilitates independent screening. Prior to title and abstract screening by two independent authors, three authors discussed two eligible studies (Ali et al., 2011; Armour Forse et al., 2011) to ensure consistency amongst their interpretation of the inclusion and exclusion criteria (MJL, NM, DS). Titles and abstracts were screened and excluded only if both reviewers agreed. For all included citations, full texts were assessed independently by two reviewers against the inclusion criteria (MJL, NM, DS). Studies that appeared to meet the inclusion criteria were retrieved in full. Disagreements between reviewers were resolved through discussion until a 100% consensus was attained. Studies not meeting the inclusion criteria were excluded with reasons for exclusion provided in the PRISMA flow diagram (Figure 3.1).

d) Data Charting

Using two included studies, three authors independently pilot tested the data extraction sheet (DS, MJL, NM) The extracted data were compared to ensure consistency throughout the elements. Guided by the Arksey and O'Malley (2005) framework, the data were extracted using the following categories: (a) characteristics of the study (e.g., author(s), year of publication, country), (b) setting, (c) aims of the study, (d) study design, (e) intervention type, use, and acceptability, (f) data collection time points, (g) study populations (carer group), (h) instruments, (i) study limitations, and (j) communication, teamwork, safety outcomes.

Figure 3.1

Selection of Sources of Evidence PRISMA Flow Diagram



e) Collating, Summarizing, and Reporting of Study Results

The extracted data were mapped against the research questions, with results summarised in tables and described narratively (Arksey & O'Malley, 2005). The outcomes were categorized into three IPC outcomes of: (a) communication, (b) teamwork, and (c) safety. The research team also reported the on characteristics of the intervention, the actual use of the intervention, and its acceptability to the IPC team members.

The PRISMA-ScR is intended to provide guidance to improve reporting of scoping reviews and increase relevance for decision making (see Appendix D). As this research is a scoping review with narrative synthesis, the relevant studies were not evaluated using a risk of bias or other study quality instruments (Arksey & O'Malley, 2005). Results are reported using the PRISMA-ScR checklist (Tricco et al., 2018).

Results

The database search generated 2533 citations and was reduced to 1840 after duplicates were removed (see Figure 3.1). Following title and abstract screening, 286 studies were retrieved in full and 266 were excluded based on the inclusion/exclusion criteria. A total of 20 studies are included in this review. Reasons for exclusion were: (a) wrong study designed (e.g., qualitative, editorials), (b) wrong participants (e.g., no nurses, nursing only) because it did not include all members of IPC in the OR, (c) not the phenomenon of interest (e.g., wrong setting, not OR focused), (d) wrong outcome (e.g., training or simulation without measuring impact on practice), and (e) study protocol.

Characteristics of Sources of Evidence

All studies were conducted in eight countries; United States (n=10 studies), United Kingdom (n=4), Brazil (n=1), Canada (n=1), France (n=1), Finland (n=1), Israel (n=1), and New Zealand (n=1) (see Table 3.2). Studies were mostly conducted in academic hospitals (75%; n=15). Studies were: (a) non-randomized intervention and controlled group with one study including interrupting time series analysis (10%; n=2) (McCulloch et al., 2017; Morgan et al., 2015), (b) pre-post using observations or survey (55%; n=11), and (c) mixed method (pre-post or post only) using observation and survey (35%; n=7). Studies' participants were members of the OR team including: (a) surgeons and often residents, (b) anesthetists and often residents, and (c) nurses (90%; n=18). The other two studies did not describe the team members (Cabral et al., 2016; Hinde et al., 2016). The median number of participants who responded to surveys was 129.5 (range 32-929) and median of 86 observations of surgical cases (range 34-37,133) (see Table 3.2).

Characteristics of Interventions to Improve IPC in the OR and their Use

Four IPC interventions evaluated in the included studies were: (a) briefing (50%; n=10 studies), (b) checklist (45%; n=9), (c) team training (35%; n=7), and (d) debriefing (20%; n=4). Studies evaluated an individual intervention (50% n=10) or a multi-faceted intervention (50% n=10) (see Table 3.3).

Briefing

Ten studies evaluated a briefing intervention (Ali et al., 2011; Awad et al., 2005; Berenholtz et al., 2009; Cabral et al., 2016; Einav et al., 2010; Gore et al., 2010; Halverson et al., 2009; Lingard et al., 2008; Makary et al., 2007; Nundy et al., 2008). A briefing refers to a

communication practice among the surgical team members before the surgical procedure to help enhance knowledge, purposeful action, quality, and safety of collaborative care (e.g., team briefing, perioperative briefing). In general, briefings were applied in various formats (e.g., list of structured items or poster) with some being documented and others conducted verbally without documentation.

Checklist

Nine studies evaluated the WHO Surgical Safety Checklist (SSC) or a version adapted for their specific setting (Ali et al., 2011; Cabral et al., 2016; Columbus et al., 2018; Hacquard et al., 2013; Molina et al., 2016; Morgan et al., 2015; Ong et al., 2016; Santana et al., 2016; Takala et al., 2011). The WHO SSC is a 19-item checklist where the entire team stops all other activity at three critical points: (a) pre-anesthesia (Sign In), (b) pre-incision (Time Out), and (c) before patient leaves the OR (Sign Out) to enhance communication between the surgical team members, improve outcomes, decrease complications, and improve patient safety (WHO, 2009). The WHO SSC has a designated area of responsibility for each of the three OR subteams (e.g., surgery, anesthesia, nursing). Nurses frequently contributed to the initiation and systematic verification of the checklist but the checklist is not always used effectively (e.g., not all aspects of verifications are executed) (Hacquard et al., 2013; Molina et al., 2016). The SSC significantly improved Sign Out compliance and team engagement by all OR subteams (Ong et al., 2016).

Team Training

Seven studies used a variety of team training interventions (Armour Forse et al., 2011; Awad et al., 2005; Gore et al., 2010; Halverson et al., 2009; Hinde et al., 2016; McCulloch et al., 2017; Morgan et al., 2015). Team training in healthcare refers to an educational program provided to a group of healthcare professionals to increase their procedural knowledge,

proficiency in their roles, skill in functioning as part of a team (teamwork), and to build overall team performance. From the seven studies implementing a team training intervention, five studies used the Crew Resource Management (CRM) approach (Awad et al., 2005; Gore et al., 2010; Halverson et al., 2009; McCulloch et al., 2017; Morgan et al., 2015). The CRM approach is a teamwork and communication model based on the aviation-style CRM communication techniques. It consists of a body of basic patient safety behaviors, including leadership, assertiveness with respect, and effective communication techniques (Awad et al., 2005; Gore et al., 2010). One study used CRM with systematic multi-organisational level team training approaches such as Standard Operating Procedures (SOP) and the Lean quality improvement management system (Lean) (McCulloch et al., 2017). Another study used the TeamSTEPPS program (Armour Forse et al., 2011). The TeamSTEPPS program is a government sponsored program composed of 12 modules that provides a rich resource-based, evidence-based approach for training groups of health professionals to improve institutional collaboration and communication relating to patient safety (CPSI, 2021). Another study used point of care (in situ) simulation on safety culture in the OR (Hinde et al., 2016). Most studies used team training as a multi-faceted intervention (see Table 3.3). Team training was described as significantly improving compliance with briefings and debriefings (Halverson et al., 2009).

Debriefing

Four studies specifically mentioned the use of debriefing as part of a multi-faceted intervention (Ali et al., 2011; Berenholtz et al., 2009; Cabral et al., 2016; Halverson et al., 2009). Debriefing refers to a structured communication among the surgical team members after the surgical procedure to review any concerns or deficits identified during the procedure. Some studies refer to debriefing as a “sign-out” from a surgical safety checklist. A high percentage

(70%) of the OR team members agreed that the debriefing tool is feasible considering their workload (Berenholtz et al., 2009).

Effect of IPC interventions on Communication, Teamwork, and Safety Outcomes

The IPC interventions are presented as a single or a multi-faceted intervention and in order of frequency (see Table 3.3).

Single-interventions

Checklist Intervention (n=6). Five of the six studies used an adaptation version of the WHO SCC except for one study using the original WHO SSC as part of a national implementation initiative (Santana et al., 2016) (see Table 3.3). Four out of the six studies measured team communication and all revealed that the checklist improved team communication (Columbus et al., 2018; Molina et al., 2016; Santana et al., 2016; Takala et al., 2011) (see Table 3.3). Although one study reported improved team communication the authors also reported that the checklist did not improve the ability to raise patient safety concerns “speaking out behavior” by the nurses and anesthesiologists (Columbus et al., 2018). For the four studies that measured teamwork, all four reported improvements as indicated by enhanced assertiveness, respect, clinical leadership, coordination, and collaboration (Columbus et al., 2018; Molina et al., 2016; Santana et al., 2016; Takala et al., 2011). Of the five studies that measured safety outcomes, four that reported the checklist helped prevent errors and improved compliance with standards of practices (Hacquard et al., 2013; Molina et al., 2016; Santana et al., 2016; Takala et al., 2011) and one study showed no differences (Columbus, 2018).

Briefing Intervention (n=4). Three of the four studies measured communication and indicated it improved significantly by either reducing communication failures, increasing

teamwork discussions, or reducing communication breakdown leading to delays (Lingard et al., 2008; Makary et al., 2007; Nundy et al., 2008). For two studies that measured teamwork, it was enhanced significantly by improving the perception of collaboration, the type of decision making used, or allowing the team to identify and resolve problems (Lingard et al., 2008; Makary et al., 2007). Patient safety was improved in all four studies by either reducing non-routine events (e.g., near misses), resolving critical knowledge gaps, helping prevent mistakes, augmenting surgical awareness, and reducing risk of wrong-site surgery.

Team Training Intervention (n=3). Of three studies, only one reported on communication and described significant improvement with the TeamSTEPPS program (Armour Forse et al., 2011). All three studies showed improvements in teamwork and in safety outcomes (Armour Forse et al., 2011; Hinde et al., 2016; McCulloch et al., 2017). For example, the study using simulation training revealed statistically significant perceived improvements in both teamwork ($P = 0.013$) and safety climate scores ($P < 0.001$) and improved awareness of and confidence in dealing with critical incidents 6–12 months after implementation of interprofessional point of care simulation sessions (Hinde et al., 2016). The study that used the TeamSTEPPS program shown increased use in antibiotics, beta blockers, and venous thromboembolism treatment with a decrease in mortality and morbidity rates and persistency after a year of implementation (Armour Forse et al., 2011). The final study showed decreased mean glitch rate compared to increased mean glitch rate for controls (McCulloch et al., 2017).

Multi-Faceted Intervention

Briefing and Team Training (n=2). Two studies employed briefing and CRM team training (Awad et al., 2005; Gore et al., 2010). One study reported improved communication for surgeons and anesthesiologists, but no difference for nurses (Awad et al., 2005) and the other study

did not measure communication outcomes (Gore et al., 2010). One study reported improved teamwork for nurses, but no difference for other team members (Gore et al., 2010) and the other study did not measure teamwork (Awad et al., 2005). Both studies reported overall improvement in patient safety. Nurses in one study improved patient safety and error reporting (Gore et al., 2010). Moreover, for patient safety, one study reported increased application of preventive measures during OR procedures (e.g., prophylactic antibiotics within 60 mins and sequential compression devices prior to induction) (Awad et al., 2005).

Briefing and Debriefing (n=1). One study used briefing and debriefing interventions (Berenholtz et al., 2009). Both briefing and debriefing were perceived to improve communication and teamwork, but the study did not measure any safety outcomes (Berenholtz et al., 2009).

Team Training and Checklist (n=1). One study used CRM team training and the WHO SSC (Morgan et al., 2015). No communication or safety outcomes were measured. There was improved teamwork, such as situation awareness, decision making, leadership and cooperation. Concurrently, there was a rise in operative glitches such as interruptions, omissions and changes affecting outcomes of the procedure.

Briefing, Checklist, and Debriefing (n=2). Two studies used briefing, debriefing and the WHO SSC, (Ali et al., 2011; Cabral et al., 2016). There was improved communication and perception of communication in both studies. One study reported no differences in teamwork and safety outcomes (Cabral et al., 2016). The other study reported improved safety outcomes by increased awareness during cases and enlightenment of potential problems (Ali et al., 2011).

Briefing, Debriefing, and Team Training (n=1). One study applied briefing, debriefing, and CRM team training (Halverson et al., 2009). The communication between team members

was improved with the use of briefings by helping alleviate OR team tensions. There was improved perception of teamwork and nurses reported better teamwork, more predominantly when briefings were used. Patient safety was improved by increased information exchanges, lessening the risks for patients and delay of care.

Discussion

This scoping review identified four IPC interventions (briefing, checklist, team training, and debriefing) for improving IPC in the OR. Most studies reported a significant improvement in results for communication, teamwork, and safety outcomes. Some of the studies reported that nurses indicated less improvements compared to surgeons, anesthesiologists, and others on the OR team, but these results were not significantly different (Awad et al., 2005; Cabral et al., 2016; Columbus et al., 2018). Overall, the findings from this scoping review indicated favorable improvements in patient safety and outcomes. However, these results need to be considered within the context of weak study designs and the need for further rigorous mixed-methods studies (Reeves, 2017). Therefore, these findings lead to the following five points of discussion.

There were different perceptions of positive outcomes among the various professions within the OR team. For example, nurses rated communication and teamwork lower compared to surgeons and anesthesiologists (Carney et al., 2010). This is consistent with findings from previous research showing discrepancies between surgical team members concerning communication, teamwork, and situation awareness (Gillespie et al., 2013; Wauben et al., 2011). All team members should understand and be well informed about the surgical procedures and about patient-specific health issues such as allergies or co-morbidities (Wauben et al., 2011). A lack of consistent perceptions between surgical team members can translate into a lack of shared understanding, leading to increased adverse events (Haynes et al., 2009; Sexton et al., 2006).

Most studies reported outcomes immediately after exposure to the intervention. In fact, only six of the 20 studies measured outcomes one year and beyond (Armour Forse et al., 2011; Berenholtz et al., 2009; Hacquard et al., 2013; Molina et al., 2016; Ong et al., 2016; Santana et al., 2016) (see Table 3.3). Although most studies were showing favorable improvements overall, one study showed that the improved communication and teamwork at one year was better than baseline, but not as strong as the earlier post intervention measurements (Armour Forse et al., 2011). These findings reinforce the recommendation from the previous Cochrane systematic review, suggesting waiting a longer period of time (unspecified) after implementation of the intervention before evaluating outcomes (Reeves et al., 2017).

The second most used intervention was the WHO SSC or an adapted version of it. The WHO SSC that is used around the world and in Canada, is a required organizational practice (Accreditation Canada, 2020; Healthcare Excellence Canada, 2021). The WHO SSC has shown significant reduction in morbidity and mortality (Haynes et al., 2009). Interestingly, one study from Canada, reported mixed findings on the effectiveness of the WHO SSC, and found that the SSC was not associated with significant reductions in operative mortality or complications (Urbach et al., 2014). Urbach and colleagues (2014), also reports on the effect of being under scrutiny impacting favorably the way some people perform (Hawthorne Effect) which may explain the strong effect of surgical checklist studies. This explication is consistent with findings of a recent Systemic Review of the Hawthorne Effect on surgical studies, showing that 63% of the 16 included studies used this effect to explain their improvements in results (Demetriou et al., 2019).

The least used intervention was debriefing, and it was always used in combination with one or more other interventions (e.g., checklist, briefing, team training). The interchangeability

of terminology of “debriefing” and “sign-out” of the surgical safety checklist in the literature may add confusion on the concept of debriefing. Hence, it is difficult to know the added effect of debriefing. The term “debriefing” should refer to the additional communication (beyond acknowledgement of the tasks performed) at the end of the surgical case addressing safety, equipment and efficiency that arose, and identifies opportunity for improvement (Brindle et al., 2018). Compared to briefing at the start of OR procedures, debriefing was shown to have less impact on communication and teamwork (Berenholtz et al., 2009). Debriefing was also found to not be as well implemented or accepted by IPC teams, and can be attributable to logistical challenges (e.g., competing priorities of subsequent surgeries) and perceived lack of value (e.g., not related to direct patient care, not valued by the institution, raised elements in debrief not addressed) (Bergs et al., 2015). To ensure meaningful debriefing, an atmosphere dedicated to open communication needs to be fostered with the commitment of resources (institutional and personnel) and leadership engagement (Brindle et al., 2018).

Most team training within the OR setting uses CRM and identified that its application required more than just the micro IP OR team involvement. For example, one study reported that when synthesizing team training approaches at various levels (micro: CRM in OR; meso: Lean and SOP adoption by the organisation), the effectiveness of the interventions to enhance safety was improved (McCulloch et al., 2017). All the interventions targeted mostly the interactional processes of the IECPCP Framework (D'Amour & Oandasan, 2005). It is important to recognize that collaboration does not only exist within the OR team, but also in the context of a larger organizational setting within all dimensions of IPC (sense of belonging, shared goals, structure of care and governance) (D'Amour & Oandasan, 2005). Therefore, effective strategies to improve IPC requires interventions targeting micro (e.g., OR team), meso (e.g., hospital policies

and processes), and macro (e.g., government and professional guidance). Furthermore, the IPC interventions should target organisation factors and systemic determinants (e.g., strong leadership, human resource management, policies and governance supporting IPC) (D'Amour & Oandasan, 2005; Reeves et al., 2017; San Martín-Rodríguez et al., 2009; Toh et al., 2017).

Limitations

There are four key limitations that need to be considered. First, out of 20 included studies, 18 used weak study designs such as pre-post observations and/or survey evaluations. Second, there is potential for self-reported bias. To overcome the potential for self-response bias, several studies used observations to measure outcomes such as compliance, non-routine events, glitch rates, and communication and teamwork interactions. Third, the assessment of methodological quality within this scoping review was not performed. This is common practice for scoping reviews unless there is a specific requirement due to the nature of the aim of the scoping review (Munn et al., 2018). Fourth, there is a need to consider the potential impact of the Hawthorne effect also referred as the “observer effect”, in which participants change their behavior when they are being observed (Nguyen et al., 2018). Eight out of ten studies described the Hawthorne effect as an explanation for the improvements in outcomes in surgical studies (Demetriou et al., 2019).

Conclusion

In the OR, four IPC interventions have been used to enhance communication, teamwork, and safety outcomes. The findings of this scoping review have focused mainly on the interpersonal processes for implementation of briefings, checklists, team training and debriefings. Although their study designs are of low quality, their outcomes show improved IPC in the OR. Therefore, more rigorous research on IPC interventions are needed using randomized

controlled trials and/or cluster trials. Interestingly organizational factors influencing IPC were not reported, and it would be beneficial to better understand how the factors within the meso and macro levels influence the micro level. Other studies highlight the need to further improve the effectiveness of IPC multi-faceted interventions targeting individuals (e.g., nurses, surgeons, anesthetists), and systems-level factors within healthcare delivery (D'Amour & Oandasan, 2005; Etherington et al., 2021; Reeves et al., 2017).

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Table 3.2*Characteristics of Included Studies*

Author, Year, Country	Setting (# Beds)	Study Aim	Study methods & timing	Interventions	Participants ^a
1. Ali, 2011 UK	Two academic hospitals (1200)	To evaluate implementation of safety briefings and understand issues affecting this process of change.	Pre-post Observations at baseline 2 months & Post Survey at 2 months	Briefing & Debriefing & Checklist/ Adaptation WHO SSC	Pre-Surgery observed N=27; Post N=34 Survey N=37 (n/r surgeons, anesthesiologists, nurses)
2. Armour Forse, 2011 USA	One academic hospital	To determine if team training improves OR performance and culture.	Pre-post Observations & Pre-post Survey at baseline & 1 year	Team training - Program (TeamSTEPPS)	N=n/r entire surgical service (surgeons, anesthesiologists, residents, nurses, scrub technicians)
3. Awad, 2005 USA	One (n/r) hospital	To determine if communication in the OR could be improved through medical team training.	Pre-Post Survey at baseline & 2 months	Team training (CRM) & Briefing	N=n/r entire surgical service (nurses, anesthesiologist, surgeons)
4. Berenholz, 2009 USA	One academic hospital (1061) (58 OR)	Evaluate the effect of a briefing and debriefing tool on perceptions of interdisciplinary communication.	Observations from previous 2 years & Post Survey at 2 years	Briefing & Debriefing	N=8 OR teams (37,133 briefing and debriefing) Survey N=40 (10 surgeons, 10 anesthesiologists, 20 nurses)
5. Cabral, 2016 USA	One community hospital (204) (8 OR)	To assess changes in relationships and postoperative outcomes after implementing modified WHO SSC	Pre-Post Survey at baseline & 2 months	Checklist/ Adaptation WHO SSC & Briefing & Debriefing &	N=93 (19 surgeons, 33 nurses, 21 surgical technologists, 20 others) Pre N=47 of 93 Post N=46 of 93
6. Columbus, 2018 USA	One academic hospital (43 OR)	[To determine] if the use of an evidence-based communication tool aimed to trigger intraoperative discussion improve communication in the OR.	Pre-Post Survey at baseline & 9 weeks	Checklist/ Adaptation WHO SSC	Pre N=103 of 514 (42 surgeons, 38 anesthesiologists, 23 nurses) Post N=81 (22 surgeons, 31 anesthesiologists, 28 nurses)

Author, Year, Country	Setting (# Beds)	Study Aim	Study methods & timing	Interventions	Participants ^a
7. Einav, 2010 Israel	One academic hospital	To develop a briefing protocol and evaluate its effect on patient safety.	Pre-Post Observations for 3 months at baseline and a year later & Post Survey at 3 months	Briefing	Surgeries observed N=232 130 without and 102 with briefing Survey N=32 (n/r surgeons, anesthesiologists, nurses)
8. Gore, 2010 USA	One academic hospital	To evaluate the perceived efficacy of the crew resource management initiative on preop briefing in the OR.	Pre-post Survey at baseline & 6 months	Team training (CRM) & Briefing	Pre N=207 of 600 (109 surgeons, 29 anesthesiologists, 49 nurses, 20 others) Post N=156 of 565 (65 surgeons, 17 anesthesiologists, 46 nurses, 29 others)
9. Hacquard, 2013 France	One academic hospital (27 OR)	To assess the perception of medical and nursing staff regarding the advantages of the checklist and its level of integration within the overall organization of the operating room.	Post Observations & Post Survey at 1 year	Checklist/ Adaptation WHO SSC	Surgeries observed N=64 Survey N=177 of 201 (36 % surgeons /residents, 16% anesthetists, 43% nurses)
10. Halverson, 2009 USA	One academic hospital	To develop and implement a team-training curriculum.	Pre-Post Observations & Pre-Post Survey at baseline & 6 months	Team training (CRM) & Briefing & Debriefing	Pre Surgery N=39 Post N=37 Surveys Pre-Post N=156 (95 nurses, 34 anesthesiologists /residents, physicians, 27 surgeons /residents)
11. Hinde, 2016 UK	One academic hospital	To assess the impact of interprofessional point of care simulation on the safety culture of operating theatres.	Pre-post Survey at baseline & at 6 to 12 months	Training (In Situ simulation)	N=84 (45 nurses, 14 healthcare assistants, 15 OR practitioners, 10 physicians) Survey Pre & Post N=46 of 72 (n/r)

Author, Year, Country	Setting (# Beds)	Study Aim	Study methods & timing	Interventions	Participants ^a
12. Lingard, 2008 Canada	One academic hospital	To assess whether structured team briefings improve OR communication.	Pre-post Observations at baseline & 5 months & Post Survey at 5 months	Briefing	Surgical Observations N=172 (86 pre and 86 post) Survey N=77 of 83 (22 surgeons /residents, 23 nurses, 32 anesthesiologists /residents)
13. Makary, 2007 USA	One academic hospital	To evaluate the impact of OR briefings on coordination of care and risk for wrong-site surgery.	Pre-post Survey at baseline & 3 months	Briefing	N=422 (34.9 % surgeons /residents, 14% anesthesiologists /residents 44.3% nurses 4.8 % medical nursing students 2% others) Pre N=306 of 360 Post N=116 of 154
14. McCulloch, 2017 UK	Five hospitals	To compare improvement in surgical team performance after interventions addressing teamwork culture, work systems, or both.	Pre-post Observations comparing non-randomized intervention group and control group at baseline & 4 months	Team training (CRM) & Systems redesign and standardization (SOP) & Lean quality improvement	N=453 operations (255 intervention, 198 control). (surgeons, nurses, anaesthetists, and others)
15. Molina, 2016 USA	Thirteen hospitals	To measure perception of multiple dimensions of perioperative safety among clinical OR personnel before and after implementation of an SSC.	Pre-post Survey at baseline & at 1 to 2 years	Checklist / Adaptation WHO SSC	Pre N=929 of 1,921 Post N=815 of 1,909 (198 surgeons, 42 anesthesiologists, 436 nurses, 161 surgical technicians, 81 others, 11 missing)
16. Morgan, 2015 UK	One District general hospital	To evaluate the effectiveness of aviation style teamwork training in improving operating theatre team performance and clinical outcomes.	Pre-post Observations using interrupting time series comparing non-randomized intervention group and control group at baseline & 3 months	Team training (CRM) & WHO SSC	Surgical case Observations N=72 operations; 37 intervention, 35 control. 3 OR sub teams (anaesthesia, surgery, nursing)

Author, Year, Country	Setting (# Beds)	Study Aim	Study methods & timing	Interventions	Participants ^a
17. Nundy, 2008 USA	One academic hospital	To evaluate the impact of briefings on operative delays.	Pre-post Survey at baseline & at 3 to 5 months	Briefing	N=422 (147 surgeons / residents, 59 anesthesiologists / residents, 187 nurses, 6 nurse assistants or PA, 16 medical students, 7 others) Pre N=306 of 360 Post N=116 of 154
18. Ong, 2016 New Zealand	One community hospital	To evaluate engagement of OR sub teams and compliance with administering checklist domains and checklist items, after introducing a wall mounted paperless checklist with migration of process leadership.	Pre-Post Observations at baseline with WHO SSC and 2 year later with wall poster 2 months post implementation	Checklist / Adaptation WHO SSC wall poster without documentation	Surgical Observations N=111 3 OR sub teams (anaesthesia, surgery, nursing)
19. Santana, 2016 Brazil	Three academics hospitals	To evaluate the attitudes and opinions regarding surgical safety among OR professionals in these hospitals before and after implementation of the checklist.	Pre-Post Survey at baseline & 2 years	Checklist / WHO SSC	N=472 (141 surgeons / residents, 90 anesthesiologists / residents, 57 nurses, 123 nursing technicians, 45 nurses assistants, 46 others) Pre N=257 of 472 Post N=215 of 472
20. Takala, 2011 Finland	Four academics hospitals	To assess the impact on the OR process, safety-related issues, and communication among surgical staff in a high-income country.	Pre-post Survey at baseline & at 2 to 4 weeks	Checklist / Adaptation WHO SSC	Pre N=901 Post N=847 of 1748 operations (n/r surgeons anaesthesiologists, nurses)

^a Participants: nurses may include; certified registered anesthetic nurses, scrub and circulating nurses.

Operating room (OR); World Health Organization (WHO) Surgical Safety Checklist (SSC); Crew Resource Management (CRM); Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS)

Table 3.3*Outcomes for IPC Interventions*

Intervention	Author, Year	Outcomes involving nurses		
		Communication	Teamwork	Safety Outcomes
Checklist	Columbus, 2018	87.34% improved team communication Unchanged speaking out behavior with training (P = 0.257). Surgeons empowered to speak up (P=0.05) not significant for nurses (P = 0.65) and anesthesiologists (P = 0.70).	Increase in perceived bravery (P= 0.049). Likelihood to take control (P = 0.05).	Improve awareness of patient disposition but not significant for surgeons (P = 0.10) and anesthesiologist (P = 0.84). Nurses reported being less aware of change in patient disposition (P = 0.22). Decreased awareness of intraoperative blood product transfusion during cases but not significant (P = 0.51). Increase awareness of intraoperative blood product transfusion during cases but not significant for surgeons (P = 0.31) and anesthesiologist (P = 0.55).
	Hacquard, 2013	40 % disagree that the checklist improve communication.	n/r	33% detected an error with the checklist.
	Molina, 2016	11.9% relative improvement (P < 0.05).	Improved all 5 teamwork dimensions (3.6% respect, 3.5% clinical leadership, 5.7% assertiveness, 2.9 % coordination, 11.9% communication; P < 0.05).	73.6% averted problems or complications.
	Ong, 2016	n/r	n/r	n/r
	Santana, 2016	92.7% improved for nurses, 87.9% anesthesiologists, 75.6% surgeons, with significant diff (P < 0.001).	Improvement perception of safety and agreement about the collaboration of the operating team, for nurses (P = 0.001) anesthesiologists (P= 0.046) not significant for surgeons (P=0.50). Improved teamwork nurses (P < 0.001) anesthesiologists (P=0.038) not significant for surgeons (P=0.49).	Improved concerns about patient safety and compliance with standards, rules, and hand-washing practices post-intervention, by anesthesia, surgeons, and nurses (P < 0.001). 90.0 % agreed checklist helps prevent errors.
	Takala, 2011	Improved discussions of critical events preoperatively (Anesthesiologists: 22.0% vs. 42.6%, Surgeons: 34.7% vs. 46.2%; P < 0.001).	Improved knowledge of names and roles among team members (Anesthesiologists: 65.7% vs. 81.8%,	Patient's identity was more often confirmed (Anesthesiologists: 62.7% vs. 84.0%, Surgeons: 71.6% vs. 85.5%, Nurses: 81.6% vs. 94.2%; P < 0.001).

Intervention	Author, Year	Outcomes involving nurses		
		Communication	Teamwork	Safety Outcomes
		Fewer communication failures (43 vs. 17; P < 0.05).	Surgeons: 71.1% vs. 83.6% Nurses: 87.7% vs. 93.2%; P < 0.01).	
Briefing	Einav, 2010	n/r	n/r	-25% reduction in the number of nonroutine events when briefing was conducted -16% increase in the number of surgeries performed without any nonroutine event. -5% and 11% reduction in the number of surgeries with one to two and three or more events (P < 0.02)
	Lingard, 2008	Mean communication failures per procedure declined (P < 0.001).	92% agreed that the briefing allowed the team to identify and resolve problems	88 % agreed briefing helped guard against mistakes. 33% agreed briefings showed utility: identify problems, resolution of critical knowledge gaps, decision-making, follow-up actions.
	Makary, 2007	Agreed team discussions are common (pre-post 52.4%-64.4%; P<0.001).	Briefings perceived to improved collaboration (P < 0.001). Agreed decision making utilized input from relevant personnel (pre-post 78.7%-89.6%; P < 0.003) Surgery and anesthesia worked together as a well-coordinated team” (pre-post 67.9% -91.5%; P < 0.000).	Briefings perceived to reduced risk for wrong-site surgery (P < 0.001). Agreed preoperative briefing increased aware of surgical site (pre-post 52.4%-64.4%; P < 0.001). Agreed surgical site was clear to me before incision (pre-post 88.2%-96.6%; P < 0.002). Briefings associated with caregiver perceptions of reduced risk for wrong-site surgery (P < 0.001). A team discussion before a surgical procedure is important for patient safety (pre-post 94.0% -93.3%; P < 0.123).
	Nundy, 2008	19% fewer communication breakdowns leading to delays (P < 0.006).	n/r	31% reduction in unexpected delays. 36% reported delays pre and 25% reported delays in the postintervention period (P < 0.04).
Team training	Armour Forse, 2011	Improved communication (P < 0.05)	Improved teamwork (P< 0.05)	Improvement in OR first case starts (69% to 81%) A year later decreased (81% to 69%; P < 0.05).

Intervention	Author, Year	Outcomes involving nurses		
		Communication	Teamwork	Safety Outcomes
				<p>Patient satisfaction improved (77% to 89.3%; $P < 0.05$) A year later decreased to 80.8%.</p> <p>Improved antibiotics use (78%-97%; $P < 0.05$).</p> <p>Improved anti-venous thromboembolism use (74% -91%; $P < 0.05$).</p> <p>Improved Beta blocker use (19.7%-100%; $P < 0.05$).</p> <p>Decreased mortality (2.7%-1.0%; $P < 0.05$) and 1 year later increased 1.5%.</p> <p>Decreased morbidity (20.2%-11.0%; $P < 0.05$) and 1 year later increased to 13%.</p>
	Hinde, 2016	n/r	Improved teamwork ($P = 0.013$).	<p>90% increased awareness of critical incidents.</p> <p>85% increased confidence in dealing with critical incidents</p> <p>Improved safety ($P < 0.001$).</p>
Team training + SOP + Lean	McCulloch, 2017	n/r	NOTECHS II score rose post intervention in the pooled active groups (72.98 pre, 76.56 post) but not in the control groups (73.31 pre, 73.03 post) Improvement ($P < 0.025$).	Mean glitch rate in active groups decreased, in the control group it rose ($P = 0.0014$).
Briefing+ Team training	Awad, 2005	Improved communication for surgeon ($P < 0.0004$); and anesthesiologist ($P < 0.0008$); no diff for nurses ($P = 0.7$).	n/r	Pre-post 84%-95% prophylactic antibiotics use within 60 min Pre-post 92%-100% sequential compression devices prior to induction 3.3% (7/213) patients identified before induction at high risk for surgery
	Gore, 2010	n/r	3/4 questions (75%) improved perception of teamwork for nurses (no diff for residents, physicians).	<p>3/11 questions (27%) improved patient safety for nurses (no diff for residents, physicians)</p> <p>1/13 questions (8%) improved error reporting for nurses and residents (no diff physicians).</p>
Briefing+ Debriefing	Berenholz, 2009	90% agreed for briefings 69% for debriefings.	90% agreed for briefing; 72% for debriefings.	n/r

Intervention	Author, Year	Outcomes involving nurses		
		Communication	Teamwork	Safety Outcomes
Team training + Checklist	Morgan, 2015	n/r	Mean NOTECHS II score increased from 71.6 to 75.4 in the active group but remained static in the control group (P = 0.047). NOTECHS II nursing score increased (P = 0.006), but the anaesthetic and surgical scores did not.	Mean glitch rate was unchanged in the control group but increased significantly (7.2–10.2/h, P=0.002) in active group. Rise in the complication rate in the active group after the intervention and a fall in the rate in the control group (P = 0.05).
Briefing, + Debriefing+ Checklist	Ali, 2011	89% improved communication	n/r	89% more aware of cases 97% highlighted potential patient problems.
	Cabral, 2016	6% increased communication (P < 0.05) 12% increased nurses' perception of communication (P = 0.002).	Decreased perception of teamwork (P = 0.29).	Decreased Safety Climate (P = 0.48).
Briefing + Debriefing+ Team training	Halverson, 2009	72% increased tension owing to information that could have been communicated during a briefing	Improved perception of teamwork in 14 out 19 questions. 75% greater sense of teamwork with briefing (nursing vs anesthesia, P = 0.13; nursing vs surgery, P < 0.001).	37% communicated information during the briefing that if not communicated would have led to an increased risk for the patient or a delay in the case.

n/r = not reported; diff = difference; Non-Technical Skills updated version (NOTECHS II); P = P value

Chapter Four

Integrated Discussion

Integrated Discussion

The overall aim of this chapter is to summarize the findings from the two articles presented in chapters two and three, to discuss overarching integrated discussion points, and identify implications for nursing.

Summary of Thesis Articles

Given that little was known about how nurses influence IPC in the OR, in chapter two, I focused on determining OR nurse perspectives toward IPC considering that nurses are crucial to IPC within the OR. I conducted a secondary analysis of the transcripts of interviews with 19 OR nurses. Using an interpretive descriptive qualitative approach (Thorne, 2008), the themes were mapped onto the four dimensions of the professional system of the Interprofessional Education for Collaborative Patient-centred Practice (IECPCP) framework (D'Amour & Oandasan, 2005). Of the 20 themes emerging from the analysis, eight were categorized under internalization, four for shared goals and vision, five for governance, and three for formalization. Nurses expressed the importance of being heard through effective communication (17 nurses; 89%), feeling confident in their role while being aware of interdependent roles (17 nurses; 89%), and sharing a common understanding (15 nurses; 79%) within the IP team. From the OR nurse perspective, the use of structured processes (13 nurses; 68%) enabled them to organize their care within the IP team. Nurses displayed leadership qualities by continuously anticipating and acting upon needs of the team (10 nurses; 53%). In summary, nurses reported contributing to IPC through their shared understanding of common goals, their leadership within the OR, and their active involvement of delivering structured processes.

Interviewed OR nurses identified structured processes such as pre-surgery and post-surgery briefings, and strategic pauses during surgery. According to the literature, however, there are no systematic reviews of interventions to promote IPC in the OR. Hence, in chapter three, I conducted a scoping review guided by Arksey and O'Malley (2005) framework to identify interventions to improve IPC involving OR interprofessional teams and determine their effect on facilitating IPC communication, teamwork, and safety outcomes. Of 1840 screened studies, 20 evaluated single or multi-faceted IPC interventions, mostly using pre-post descriptive study design. None of the studies used randomized controlled designs. The Findings revealed four IPC interventions: (a) briefings (n=10 studies; 50%), (b) checklists (n=9; 45%), (c) team training (n=7; 35%), and (d) debriefings (n=4; 20%;). Studies evaluated an individual intervention (n=10; 50%) or a multi-faceted intervention (n=10; 50%). Despite the use of low quality study designs, the interventions enhanced IPC, improved communication and teamwork among IPC team members, and enhanced safety outcomes. Only one study involving team training reported on organisational level interventions (e.g., Standard Operating Procedures (SOP); Lean quality improvement management system (Lean)) to support IPC among OR teams. More rigorous study designs are needed to determine the effect of interventions on improving IPC in the OR.

Integrated Discussion Points

Four main discussion points emerged from the analysis of the findings of both studies (Chapters Two and Three) within this thesis. They will be presented as follows: (a) validating the IECPCP framework, (b) team training to acquire a cohesive language, (c) classification of interventions to improve IPC, and (d) lack of consistency in measurement.

Validating the IECPCP Framework

One systemic review compared the conceptual frameworks of interprofessional and interorganizational collaboration in healthcare. It found common elements between both frameworks such as communication, trust, respect, mutual acquaintanceship, power, shared goals, congruent philosophies and values, consensus, patient-centredness, task characteristics, and environment (Karam et al., 2018). The IECPCP framework of D'Amour and Oandasan, (2005) is a combination of interprofessional and interorganizational collaboration (Chapter 1). My qualitative study provided a unique perspective of themes identified from interviews with perioperative nurses mapped onto this framework (D'Amour & Oandasan, 2005; Chapter 2), while my other study identified interventions to support IPC (Chapter 3). However, neither adequately discussed interprofessional organizational interventions. This thesis provided favorable contribution to all four assertions of the IECPCP framework. The findings demonstrate that: (a) interprofessional practice needs the support and interactions from the organisation to effectively improve IPC, (b) this study provides a greater understanding and an application of the concept of interprofessionality, and (c) the satisfaction among healthcare providers, especially nurses, helps to improve teamwork, leading to enhanced patient outcomes (Chapter 2 & 3). In summary, the results in Chapter Two and Three lend support for the validation of the IECPCP framework and its related concepts. They also reinforce the need for interventions that target the full range of disciplines in the OR (surgeons, anesthesiologists, nurses) and the organizational structures that support or hinder IPC at the micro level.

Team Training to Acquire a Cohesive Language

The application of teamwork processes (briefings, checklist, debriefing) through team training (CRM, Team STEPPS, simulations) helps to provide a cohesive language for

collaboration among all OR team members. This has proven to help nurses feel more integral to the team by the sharing of critical information, increasing confidence and team familiarity (Russ et al., 2013). Effective teamwork (e.g., communication, coordination, collaboration) in the OR can be improved by team training (Weaver et al., 2010; Chapter 3). Team training can contribute to improved quality and progress of perioperative nursing and a better work environment for all IP team members in the OR (Holmes et al., 2020). Moreover, team training can improve patient outcomes (e.g., reductions of adverse events, reduction of mortality and morbidity) (Weaver et al., 2010; Chapter 3). The OR IP team's best possible performance relies on open dialogue, shared understanding of roles and expectations, anticipating needs, and is significantly dependent on how organisational culture encourages such discussions to promote a culture of patient safety (Gillespie et al., 2013; Chapter 2).

When IPC interventions are learned, applied and fostered, the level of teamwork is enhanced (Chapter 3). The lack of stability within OR teams, the lack of organisation support, and the negative effects of hierarchical structure remaining omnipresent in the OR and impeding the nurse's leadership in fostering IPC are matters of concern (Kennedy et al., 2019; Chapter 2). To overcome the negative effects of the nature of hierarchies (e.g., power struggles) and their impact on nurses, interventions should engage the full team (surgeons, anesthetists, nurses) to foster trust, mutual respect, mutual acquaintanceships, and professional role clarification (D'Amour et al., 2008; Karam et al., 2018; Chapter Two). When interventions are sub-optimally employed or when key individuals have not been brought into the process, interventions may adversely impact the functioning of the team and possibly compromise patient safety. (Russ et al., 2013; Chapter 2).

In the qualitative study, none of the nurses stated they had received IPC training. However, they identified opportunities for training to enhance IPC such as simulation training (Chapter 2). In the scoping review, 48 studies were excluded because they used simulation-based training without measuring outcomes in clinical practice (Chapter 3). Overall, principle-based training (i.e., Crew Resource Management (CRM) and Team Strategies and Tools to Enhance Performance (Team STEPPS)) and simulation-based training seem to provide the greatest opportunities for reaching goals for team functioning and optimizing patient safety outcomes (Buljac-Samardzic et al., 2020; Chapter 3).

Classification of Interventions to Improve IPC

Collaboration, communication, coordination, and teamwork are all concepts frequently used in studies to explain IPC (Chapter 1). In keeping with the IECPCP Framework, the definition of IPC refers to the concept of “interprofessionality” which is the process by which professionals from different disciplines develop ways of practicing by which they are able to provide an integrated and cohesive response to the needs of the patient (D'Amour & Oandasan, 2005). Interprofessionality is consistent with previous definitions such as the involvement of members of more than one health and/or social care profession interacting together with the explicit purpose of improving IPC (Zwarenstein et al., 2009).

The literature identified various classifications of IP interventions. For example, a 2009 Cochrane review on randomised control studies (RCT) identified three types of practice-based IPC interventions: interprofessional rounds, interprofessional meetings, and externally facilitated interprofessional audits (Zwarenstein et al., 2009). None of the included RCTs evaluated other types of IP practice interventions consistent with those identified in the OR setting (Chapter 3; e.g., checklists, debriefing). This was consistent with findings from the scoping review of

interventions to improve IPC (Chapter 3). In fact, I identified four interventions to improve IPC in the OR (briefing, checklist, debriefing and team training) (Chapter 3). Two previous systematic reviews identified three types of IPC interventions: (a) interprofessional education or training (e.g., seminars, workshops, courses, simulation, placements/fieldwork), (b) interprofessional practice or tools for use in practice (e.g., interprofessional checklists, meetings, rounds, communication tools, briefings, forms, pathways), and (c) interprofessional organisational interventions (e.g., focus groups on organisational changes, consultations, redesign of structures, standardization) (Buljac-Samardzic et al., 2020; Reeves et al., 2011). Only one study I examined evaluated the effects of interprofessional organizational interventions (e.g., SOP, Lean) (McCulloch et al., 2017).

Adding to the complexity of my study, some reviews and studies mixed terms/descriptors when describing tools (e.g., pre /post briefing interventions) within the surgical safety checklist intervention for improving IPC in the OR (Ali et al., 2011; Lingard et al., 2008; Russ et al., 2013). For example, the Canadian version of the WHO Surgical Safety Checklist refers to its subsection as briefings, time out, and debriefing (Healthcare Excellence Canada, 2021). For the purpose of my qualitative study and scoping review, I used the terminology identified by the nurses (Chapter 2) and described in the individual studies (Chapter 3). It would be helpful to have a set of standardized terms.

Lack of Consistency in Measurement

Within the scoping review (Chapter 3), seven instruments were used to measure outcomes of interventions for improving IPC in the OR (see Table 4.1). These were: (1) Safety Attitudes Questionnaire (SAQ OR) and its case based version the OR Briefing Assessment Tool (ORBAT): up to 60-items with 17-items measured on a 5-point scale and a 12 to 15-items (short

version) or 31 to 35 items (long version) safety climate sub-scale from SAQ & ORBAT scored on a 7-point scale; (2) WHO Compliance Tool with 3-items measured on a

Table 4.1

Instruments Used for Measuring the Interventions to Improve IPC in the OR

Instrument name	Author, year, country	Instrument characteristics	validity	reliability	other
1. Safety Attitudes Questionnaire (SAQ) OR version	Cabral, 2016 USA	The SAQ is 60 items structured used to measure caregiver attitudes on 6 patient safety factors: <ol style="list-style-type: none"> 1. Teamwork climate, 2. Safety climate, 3. Job satisfaction, 4. Perceptions of management, 5. Working conditions, and 6. Stress recognition The OR version of the SAQ includes a collaboration and communication section where respondents indicate the quality of communication, they have experienced with each type of provider in the OR. 5-point Likert scale	√	√	Psychometrically sound, specific, to patient outcomes, and a good indicator of caregiver impressions and attitudes to safety.
	Hinde, 2016 UK				
	Santana, 2016 Brazil				
	Makary, 2007 USA	A case-based version of SAQ OR called the OR Briefing Assessment Tool (ORBAT). 17-question survey questioned relating to the awareness and understanding of the surgical site, willingness to speak up when problems were perceived, and the quality of teamwork and communication between caregivers in the OR. 5-point Likert scale.	√	√	
	Nundy, 2008 USA				
	Molina, 2016 USA	Safety Climate Sub-Scale from the SAQ & ORBAT. Designed to measure perception of dimensions of OR safety among clinical OR personnel before and after implementation of a surgical safety checklist. 5 teamwork factors we defined as: <ol style="list-style-type: none"> 1. respect, 2. clinical leadership, 3. assertiveness, 4. coordination, 5. communication The long and short versions of the preintervention included 35 and 12 items. The long and short versions of the postintervention survey included 31 and 15 items. 7-point Likert scale	√	√	
2. World Health Organization (WHO) Compliance tool	McCulloch, 2017 UK	Compliance with the WHO SSC was evaluated by recording whether time-out (T/O) and sign-out (S/O) procedures were attempted, and by scoring the quality of the time out procedure using a 3-point assessment tool. T/O procedures were	√	√	
	Morgan, 2015				

Instrument name	Author, year, country	Instrument characteristics	validity	reliability	other
	UK Ong, 2016 New Zealand	recorded as “full compliance” (those scoring 3/3 on this assessment) or not.			
3. Oxford non-technical skills (NOTECHS) II	McCulloch, 2017 UK Morgan, 2015 UK	Non-technical teamwork skills were assessed on 4 dimensions: 1. situational awareness, 2. problem solving & decision making, 3. leadership & management 4. teamwork & cooperation) 1–8 point scale (nursing, surgical and anesthetic sub teams) to a possible total of 96.	√	√	
4. Glitch count	McCulloch, 2017 UK Morgan, 2015 UK	Glitches are deviations from the recognized process with the potential to reduce quality or speed, including interruptions, omissions, and changes, whether these affected the outcome of the procedure. It records and categorizes all observed process deviations and reports a glitch rate per hour.	√	√	
5. Agency for Healthcare Research and Quality (AHRQ) benchmark survey	Armour Forse, 2011 USA Gore, 2010 USA	The AHRQ hospital survey on patient safety culture assessing knowledge about teamwork and safety. Survey comprised 45 items designed to assess patient safety issues throughout the hospital. A total of 28 questions dealt with crew resource management specific to the OR; these comprised questions dealing with teamwork (n = 4), the reporting of errors (n = 13), and the overall climate of patient safety (n = 11). 5-point Likert scale	n/r	n/r	Psychometrically sound to assess patient safety culture. (https://www.centerforpatientsafety.org/emsforward/culturesurvey/)
6. a) Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) Assessment b) TeamSTEPPS Self Assessment	Armour Forse, 2011 USA	a & b TeamSTEPPS Assessment and TeamSTEPPS Self-Assessment questionnaires: 1. communication 2. teamwork 3. team’s performance (foundation, function, performance, skills, leadership, climate, and identity) 5-point Likert scale	√	√	DoD and the AHRQ to improve institutional collaboration and communication to patient safety.
7. The International Personality Item Pool (IPIP)	Columbus, 2018 USA	Survey based on the IPIP scales were developed, with the aim of assessing attitudes regarding: 1. intraoperative communication practices 2. perceptions of tool utility 3. intraoperative patient status awareness 5-point Likert scale	√	√	Validated by an expert panel of nine acute care surgeons.

DoD: Department of Defence

3- point scale; (3) Oxford Non-Technical Skills updated version (NOTECHS II) with

4-dimensions measured on 8-point scale; (4) Glitch Count defined deviations from the recognised process (e.g., interruptions, omissions) all recorded reports a glitch rate per hour; (5) Agency for Healthcare Research and Quality (AHRQ) benchmark survey with 45-items measured on a 5-point scale; (6) TeamSTEPPS assessment survey with 3-dimensions measured on a 5-point scale; and (7) International Personality Item Pool (IPIP) with 3-items measured on a 5-point scale.

The most commonly used instruments included the SAQ OR and its related versions (ORBAT and Safety Climate sub-Scale) (n= 6 studies). The SAQ OR and related versions were used to measure single interventions or multi-faceted interventions (briefing, team training, checklist, and/or debriefing). The SAQ OR is psychometrically sound and is a good indicator of caregiver impressions and attitudes to safety, and specific to patient outcomes (Sexton et al., 2006). Interestingly, eight studies (40%) developed and/or applied their own evaluation items unique to their study with no reported psychometric properties (Ali et al., 2011; Awad et al., 2005; Berenholtz et al., 2009; Einav et al., 2010; Hacquard et al., 2013; Halverson et al., 2009; Lingard et al., 2008; Takala et al., 2011). It was, therefore, difficult synthesizing findings and making comparisons across the various types of interventions (Chapter 3). Our findings were consistent with other reviews indicating a great variety of measurement relating to IPC, use of instruments with questionable evidence of psychometric properties, and lack of tools to assess teamwork performance during intraoperative crisis situations (Boet et al., 2018; Russ et al., 2013)

Implications for Nursing

In accordance with the Canadian Nursing Association (CNA) Advance Practice Nursing (APN) framework (2019), the APN core competencies are based on an appropriate depth, breadth and range of nursing knowledge, theory, and research, enhanced by clinical experience, and are exhibited by all APNs (CNA, 2019). The ability to collaborate is essential for APNs to implement interprofessional practice models and analyze complex health problems in an interactive environment (CNA, 2019; Pohl et al., 2010). APNs can contribute to IPC in several ways: by documenting and analyzing their experience with collaboration in published case studies, by serving as preceptors for students and helping them develop the skills essential for collaboration, and by working with researchers who are studying the characteristics and clinical implications of collaboration (Tracey & O'Grady, 2019). The overall implications of this thesis for nursing are described narratively under clinical practice, education, leadership and collaboration, and research. Considering these categories of competencies, I have identified implications for my thesis findings for APNs and frontline nurses (see Table 4.2).

Clinical Practice

Interprofessional client-centred care requires collaboration among clients, nurses and other health professionals who work together at the individual, organizational and healthcare system levels (Canadian Nurses Association (CNA), 2020). Being cognizant of how interpersonal factors may affect patient safety is an important first step to improve the quality of patient care (Lee & Doran, 2017).

Table 4.2*Implications of Findings for APNs and Nurses.*

CNA APN Categories of Competencies	Implications of thesis findings for APNs and Nurses
Clinical Practice	<ul style="list-style-type: none"> • Assessing/recognizing/reflecting on individual contribution towards IPC practice to optimize patient safety. • Offering or facilitating use of strategies to improve IPC. • Interacting within the IP OR team as a unique contributor while recognizing the interdependent roles.
Education	<ul style="list-style-type: none"> • Supporting novice nurses to feel competent as part of the OR IPC. • Helping nurses develop their skills that are essential for IPC.
Leadership & Collaboration	<ul style="list-style-type: none"> • Incorporating OR IPC clinical practice guideline evidence to foster an environment of IPC. • Recognizing nurses for their work within IP teams. • Promoting collaboration and local leaders. • Promotion of open discussion regarding tensions among IP team members.
Research	<ul style="list-style-type: none"> • Assessing interventions' specificity and timeline for evaluations to improve IPC within the OR. • Assessing organizational barriers and facilitators to implementing OR IPC interventions. • Assessing interventions to improve working relationships, and recognition of nurses. • Using scoping review findings on IPC interventions in the OR to justify conducting a randomized controlled trial to evaluate IPC interventions.

CNA: Canadian Nurses Association *APN*: Advance Practice Nurse

In my thesis, the qualitative study (Chapter 2) provided narratives, in their own words, of OR nurse contributions towards improving IPC to optimize patient safety and outcomes. Nurses interacting within the IP OR team act as a unique contributor and recognize the interdependency of each other's roles within the team (Chapter 2). Armed with this knowledge, OR nurses and managers are better equipped to identify areas to improve and develop in clinical practice. This study suggests that the organisational level (meso level) could better recognise nurses for their work on the IP team (e.g., providing incentive, positive feedback). This finding is supported by a

study demonstrating that interprofessional relations and the need for recognition are important for nurse retention in the OR (Laflamme et al., 2019).

The meso level could also offer structures for the professional development of nurses. For example, management should support nurses who mentor novice nurses by minimizing staff rotations and offering them opportunities to build relationships and familiarity, in order to support IP teamwork. Familiarity with team members has been shown to foster advanced planning, thus minimizing distractions and interruptions that have an impact on OR nurses' performance in regards of non-technical skills (e.g., communication, task management, situational awareness) (Kang et al., 2015). Effective communication increases significantly with the frequency of interaction, close working relationships, and socialization among clinicians (Stucky et al., 2020). Further, the co-located space in which OR IP team members practice together implied increased familiarity, therefore improved engagement among the team (Kennedy et al., 2019). Inconsistent or ineffective communication among surgical team members was found to be an independent predictor of occurrences of prolonged operative times, lengthy hospital stays, and hospital readmissions (Xiao et al., 2015). Managers should therefore make every effort to facilitate communal workplaces and team consistency. Further, they should institute processes in the OR (meso level) to address unfavorable behaviors that impede IPC (e.g., anonymous denunciation, black box recordings). If we desire to create surgical teams that deliver quality care, we must consider not only individual attributes but also the context in which teams evolve (Kennedy et al., 2019).

Education

Interprofessional education is one of the main determinants of successful IPC. The education system is, therefore, the principal level for the development and promotion of this

concept (San Martín-Rodríguez et al., 2009). Interprofessional collaboration needs to be integrated throughout the educational journey of the nurse, starting at the undergraduate level through to the professional level (CNA, 2020). Beyond the academic curriculum, OR novice nurses will replicate what they see and hear within the IP team. Hence, the OR IP team can also foster IPC through display of effective communication and teamwork (Lingard et al., 2002; Chapter 2). As educators, we need to enhance our understanding of the implicit development of professional identity, particularly in terms of what novice OR nurses learn while eavesdropping on and participating in the talks that facilitates everyday work (Lingard et al., 2002).

Leadership and Collaboration

This thesis identifies the strengths and gaps in leadership displayed by OR nurses and the organisation that impede IPC. As per Colette and colleagues (2017), nurses in the OR rate collaboration low despite the physical proximity of physicians and nurses working side by side. Before establishing interventions and goals towards improving collaboration at a micro level (for example in the operating room), additional information from the IP team (e.g., people, processes, and behavioural patterns) should be elicited to identify specific challenges unique to each setting (Collette et al., 2017). High-level leaders (meso/macro levels) have a strategic role, both internally and externally, in promoting collaboration. Micro level leaders are best placed to ensure that organizational barriers to collaboration are reduced (D'Amour et al., 2008). Incorporating IPC evidence based clinical practice guidelines has been shown to help nurses foster an environment of IPC in the OR (Chapter 2). Management may also benefit from providing OR nurses with professional advancement opportunities (Chapter 2). According to the CNA position statement on “Interprofessional Collaboration” (2020), hierarchies that have been established between disciplines over time are not conducive to IPC (Bell et al., 2014). Promoting

open discussion about the tensions between traditional and interprofessional discourses of collaborative leadership may possibly help OR nurses and IP team members work together more effectively (Lingard et al., 2012).

Research

Evidence-informed decision-making and the use of best practice guidelines, protocols and resources will support IPC (CNA, 2020). Hence, OR nurses can use this evidence as part of IPC initiatives to enhance quality. Further research should be conducted utilizing D'Amour's framework and its 10 validated indicators of collaboration to identify the level of collaboration that would help provide tangible evidence of nurses' collaborative status within the OR (D'Amour et al., 2008). This study and others have identified the need for more research on the evaluation of intervention specificity and timeline (Hacquard et al., 2013; Reeves et al., 2017). The interactional factors of collaboration within IPC have been most researched. However, there is still a requirement for further research to examine cultural, gender, and power struggles differences on teamwork recognising individual, team and systems-level influencing factors within the OR setting (Etherington et al., 2021). Interventions to improve working relationships and recognition of nurses are promising venues for research for improving nurse satisfaction in the OR (Laflamme et al., 2019; Chapter 2). Likewise, this thesis and another study also identified the need for further research on organizational factors and the training and support nursing leaders require to enable OR nurses to speak up and advocate for their patients (Wade, 2014). Consistent with these findings, a recent scoping review found that collaboration within an organization increases professional satisfaction, enhances the development and sustainability of a team, improves the working atmosphere, and reinforces the affective commitment of practitioners to their organization (Karam et al., 2018).

Conclusion

The aim of my thesis was to explore the contributions of nurses to IPC in the OR. My first study showed that nurses contribute to IPC in the OR mainly through interactional processes and they require organizational support to foster their efforts. My scoping review showed that few IPC interventions of lower quality design have been studied in the OR. However, the IPC interventions in this scoping review favored improved communication and teamwork within the IP team and showed a promising increase towards safety outcomes for patients. Further, nursing involvement appeared to be crucial in all IPC interventions in the OR. Despite its limitations, the findings of this thesis provide professionals and managers with a deeper understanding of collaborative practice and the specific contribution of OR nurses towards IPC. Nurse contributions to IPC are undeniably important to improve IPC in the OR. Nurses can play a major role in tackling the challenges of interprofessional collaboration. They are in an excellent position to assume the lead role in IPC, considering their professional status, their unique contribution to holistic patient care, and their close interaction with other professionals and leadership.

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[content/pdf-en/cna-position-statement_interprofessional-](https://www.cna-aiic.ca/-/media/cna/page-content/pdf-en/cna-position-statement_interprofessional-collaboration.pdf?la=en&hash=E1177042D65084A8792865A62ED0C78B46F87287)

[collaboration.pdf?la=en&hash=E1177042D65084A8792865A62ED0C78B46F87287](https://www.cna-aiic.ca/-/media/cna/page-content/pdf-en/cna-position-statement_interprofessional-collaboration.pdf?la=en&hash=E1177042D65084A8792865A62ED0C78B46F87287)

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Appendix A

Université d'Ottawa

Bureau d'éthique et d'intégrité de la recherche

University of Ottawa

Office of Research Ethics and Integrity

Lettre d'approbation administrative | Letter of administrative approval

Numéro de dossier / Ethics File Number	H-11-20-6275
Titre du projet / Project Title	Interprofessional Collaboration in the Operating Room: A nursing Perspective
Type de projet / Project Type	Thèse de maîtrise / Master's thesis
CÉR primaire / Primary REB	
Statut du projet / Project Status	Approuvé / Approved
Date d'approbation (jj/mm/aaaa) / Approval Date (dd/mm/yyyy)	30/11/2020
Date d'expiration (jj/mm/aaaa) / Expiry Date (dd/mm/yyyy)	14/10/2021

Équipe de recherche / Research Team

Chercheur / Researcher	Affiliation	Role
Marie-Julie LEVESQUE	École des sciences infirmières / School of Nursing	Chercheur Principal / Principal Investigator
Dawn STACEY	École des sciences infirmières / School of Nursing	Superviseur / Supervisor
Michelle LALONDE	École des sciences infirmières / School of Nursing	Autre / Other

Conditions spéciales ou commentaires / Special conditions or comments:

OHSN REB Protocol ID: 20200626-01H

Appendix B



The Ottawa
Hospital
RESEARCH
INSTITUT

L'Hôpital
d'Ottawa
INSTITUT DE
RECHERCHE



UNIVERSITY OF OTTAWA
HEART INSTITUTE
INSTITUT DE CARDIOLOGIE
DE L'UNIVERSITÉ D'OTTAWA

*Ottawa Health Science Network Research Ethics Board (OHSN-REB) / Conseil
d'éthique de la recherche du réseau de science de la santé d'Ottawa (CÉR-RSSO)*

Date: October 15, 2020
Principal Investigator: Dr. Sylvain Boet, TOH/OHRI
Protocol ID: 20200626-01H
Study Title: Interprofessional Collaboration in the Operating Room: A nursing perspective
Submission Type: Initial Application
Review Type: Delegated
Date of Approval: October 14, 2020
Approval Expiry Date: October 14, 2021

Dear Dr. Boet,

An **Institutional approval (OHRI) letter is required prior to the conduct of the study** at this site. The institutional approval letter is an indication that you have satisfied ethics, contracts, departmental notifications, as applicable.

Thank you for submitting the above referenced study. The Ottawa Health Science Network Research Ethics Board (OHSN-REB) has reviewed the application and granted approval for your study. This approval is granted until the expiration date noted above. This research study is to be conducted by the investigator noted above.

The **OHSN-REB ethics approval** is applicable only for The Ottawa Hospital .

Documents Approved:

Document Name	Document Version Date
Protocol	September 17, 2020

No deviations from, or changes to, the protocol should be initiated without prior written approval of an appropriate amendment from the OHSN-REB, except when necessary to eliminate immediate hazard(s) to study participants.

REB members involved in the research project do not participate in the review, discussion or decision.

If the study is to continue beyond the expiry date noted above, a Continuing Review Form must be received by the OHSN-REB on or prior to the full board submission deadline date of the meeting scheduled to occur a minimum of 30 days prior to the study expiry date. If the study has been completed by the expiry noted above, a Study Closure Report must be received by the OHSN-REB.

The OHSN-REB operates in compliance with, and is constituted in accordance with, the requirements of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use; Integrated Addendum to ICH E6 (R1): Guideline for Good Clinical Practice E6 (R2); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations and the provisions of the Ontario Personal Health Information Protection Act (PHIPA 2004) and its applicable regulations. OHSN-REB is qualified through the CTO REB Qualification Program and is registered with the U.S. Department of Health and Human Services (DHHS) Office for Human Research Protection (OHRP).

Please do not hesitate to contact us if you have any questions.

Sincerely,

Appendix C

Scoping Review Searches

OID MEDLINE

Interprofessional Collaboration in the OR: A Nursing Perspective

October 31, 2020

1. Perioperative Nursing/ or Operating Room Nursing/ or Nursing/ or Postanesthesia Nursing/
2. Nurses/ or Nurse's Role/
3. nurs*.ti,ab,kw.
4. 1 or 2 or 3
5. interprofessional relations/ or interdisciplinary communication/ or physician-nurse relations/
6. Patient Care Team/
7. (interprofessional* adj3 collaborat*).ti,ab,kw.
8. (interprofessional* adj3 relation*).ti,ab,kw.
9. (interdisciplinary adj3 collaborat*).ti,ab,kw.
10. (multidisciplinary adj3 collaborat*).ti,ab,kw.
11. 5 or 6 or 7 or 8 or 9 or 10
12. Operating Rooms/
13. perioperative care/ or intraoperative care/ or perioperative nursing/ or postoperative care/
14. (operating adj2 room*). ti,ab,kw.
15. (operating adj2 theat*).ti,ab,kw.
16. perioperative.ti,ab,kw.
17. 12 or 13 or 14 or 15 or 16
18. 4 and 11 and 17
19. limit 18 to yr="2005 -Current" (results: **732**)

OVID PsycINFO

Interprofessional Collaboration in the OR: A Nursing Perspective

Novembre 6, 2020

1. nurses/ or nursing/
2. Roles/ or Health Personnel Attitudes/
3. nurs*.ti,ab.
4. 1 or 2 or 3
5. Health Personnel/ or Interdisciplinary Treatment Approach/ or Health Care Services/ or Teamwork/ or Collaboration/
6. Interpersonal Communication/
7. (interprofessional* adj3 collaborat*).ti,ab.
8. (interprofessional* adj3 relation*).ti,ab.
9. (interdisciplinary adj3 collaborat*).ti,ab.
10. (multidisciplinary adj3 collaborat*).ti,ab.
11. 5 or 6 or 7 or 8 or 9 or 10
12. surgery/ or postsurgical complications/ or surgical patients/
13. (operating adj2 theat*).ti,ab.
14. (operating adj2 room*).ti,ab.
15. perioperative.ti,ab.
16. 12 or 13 or 14 or 15
17. 4 and 11 and 16
18. limit 17 to yr="2005 -Current" (**results: 118**)

CINAHL

Interprofessional Collaboration in the OR: A Nursing Perspective

Novembre 6, 2020

1. (MH "Perioperative Nursing")
2. (MH "Perianesthesia Nursing")
3. (MH "Nursing Role")
4. (MH "Nurses+")
5. "nurs*"
6. S1 OR S2 OR S3 OR S4 OR S5
7. (MH "Interpersonal Relations") OR (MH "Interprofessional Relations") OR (MH "Intraprofessional Relations") OR (MH "Nurse-Patient Relations") OR (MH "Nurse-Physician Relations")
8. (MH "Multidisciplinary Care Team")
9. (interprofessional* N3 collaborat*)
10. (interprofessional* N3 relation*)
11. (interdisciplinary N3 collaborat*)
12. (multidisciplinary N3 collaborat*)
13. S7 OR S8 OR S9 OR S10 OR S11 OR S12
14. (MH "Operating Rooms")
15. (MH "Perioperative Care") OR (MH "Intraoperative Care") OR (MH "Postoperative Care") OR (MH "Preoperative Care") OR (MH "Postoperative Period") OR (MH "Preoperative Period")
16. (operating N2 room*)
17. (operating N2 theat*)
18. perioperative or intraoperative
19. S14 OR S15 OR S16 OR S17 OR S18
20. S6 AND S13 AND S19
21. S6 AND S13 AND S19 Limiters - Published Date: 20050101-20201231 (**results: 1,259**)

OID EMBASE

Interprofessional Collaboration in the OR: A Nursing Perspective

17 Novembre 2020

1. Perioperative Nursing/ or Operating Room Nursing/ or Nursing/ or Postanesthesia Nursing/
2. Nurses/ or Nurse's Role/
3. nurs*.ti,ab,kw.
4. 1 or 2 or 3
5. Patient Care Team/
6. interdisciplinary communication/
7. doctor nurse relation/
8. patient care/
9. (interprofessional* adj3 collaborat*).ti,ab,kw.
10. (interprofessional* adj3 relation*).ti,ab,kw.
11. (interdisciplinary adj3 collaborat*).ti,ab,kw.
12. (multidisciplinary adj3 collaborat*).ti,ab,kw.
13. 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12
14. operating room/
15. perioperative period/
16. (operating adj2 room*).ti,ab,kw.
17. (operating adj2 theat*).ti,ab,kw.
18. perioperative.ti,ab,kw.
19. 14 or 15 or 16 or 17 or 18
20. 4 and 13 and 19
21. limit 20 to yr="2005 -Current" (**results: 424**)

Appendix D

The PRISMA-Scoping Review 1/2

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	

The PRISMA-Scoping Review 2/2

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	
Limitations	20	Discuss the limitations of the scoping review process.	
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (8) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

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