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Aim
To develop and expand how nurses promote safety in perioperative settings.

Background
This article presents orchestrating a sub-core category from the theory of anticipatory vigilance in promoting safety within preoperative settings (O’Brien 2018). Orchestrating explains this and involves effective planning, delegating, co-ordinating and communication.

Method
A classic grounded theory methodology was used. Ethical approval was granted. Data comprised of 37 interviews and 33 hours of non-participant observation. Data analysis followed the principals of classic grounded theory.

Results
Orchestrating is fundamental in promoting safety and minimising risk of errors and adverse events in the perioperative setting. Nurses achieve this through four categories: macro orchestrating, locational orchestrating, situational orchestrating and being in the know.
Conclusion(s)

Nurses minimise risk by fostering a culture of safety, risk awareness, effective management and leadership.

Implications

Effective management structures and support systems are essential in promoting a culture of safety in perioperative setting.

Keywords

Management, Risk, Perioperative, Nursing, Safety, Classic Grounded Theory.

Introduction

This paper develops and expands on the concept of orchestrating as a strategy for promoting safety by minimising risk which was briefly presented in the theory of Anticipatory Vigilance (O’ Brien et al 2018). Perioperative nurses meet significant challenges in maintaining patient safety in the perioperative environment worldwide (Rothrock 2019). The World Health Organisation (2008a, 2009a) states that two hundred and thirty four million major surgical operations are performed annually. They breakdown as follows: sixty three million to treat traumatic injuries, ten million surgical operations for pregnancy-related complications and thirty one million for cancer care. Major surgical complications, disabilities and increased hospital inpatient stay occur for three to sixteen per cent of patients, depending on the complexity of surgery and the hospital setting. Within developing countries, death occurs in five to ten per cent of patients during major surgery (World Health Organisation 2009a). Against a background of risk within such an intense technological environment exploring how nurses manage risk and promote safety is critical.

Aim

To develop and expand how nurses promote safety in perioperative settings.

Background

Healthcare safety has changed dramatically within the last 10 years (Sevdalis et al. 2012). Patient safety is now both a global priority. Major reports such as To Err Is Human and An Organisation with a Memory, identified human error and the occurrence of adverse events (Kohl et al 1999). Within the perioperative area human error can have major or minor consequences (World Health Organisation 2009a). The goal to reduce error rates can be achieved by either eliminating or minimising risk and hazards within the context and structures of care (Department of Health and Children 2008).

Fostering an environment where safety is prioritised, is essential to healthcare quality (Ammpuri et al. 2015, Rothrock, 2019). Patient safety is a constant challenge in the perioperative setting. The impact of surgical intervention on health care systems continues to rise with the increases in traumatic injuries, cancers, cardiovascular disease and new surgical technologies. Within the complexity of modern surgery many hazards and risks are...
present from equipment, electrical products, laser, to the storage of surgical requisites and instruments (Association of periOperative Registered Nurses 2018).

A risk aware safety culture requires good leadership, involvement of all stakeholders, training and learning on the job, staff accountability and good communication (Flin & Yule 2004). The Irish nursing organisational structure provides for three grades of first line Clinical Nurse Managers (CNM): CNM1 reporting to a CNM2; CNM2 in charge of a ward or unit; and CNM3 in charge of a department (Government of Ireland 1998). These roles are present in all hospital settings. Good relationships are essential between nurse managers and staff nurses to maintain a healthy and safe workplace (Lee et al 2019). Transformational leadership is essential in improving patient safety culture and creating an environment for safety innovation for clinical nurses (Weng et al. 2015). To date how nurses manage risk in the perioperative setting is under researched. Classic grounded theory was chosen for the main study because it is very effective where little is known about an area. Detailed attention is given to the significance of orchestrating which emerged as a fundamental concept in minimising risk.

**Method(s)**

Classic grounded theory methodology (Glaser 1978, 1992) was used to explore the issue of risk in the perioperative setting (O’ Brien 2018). Grounded theory is an inductive methodology enabling the emergence and conceptualisation of latent social patterns within a substantive area of study through the process of constant comparison (Glaser, 1978). Its aims to generate a theory that accounts for these behaviours and enables the emergence of a multivariate theory on how people resolve their main concern (Glaser 2015).

**Ethical considerations**

Ethical approval was granted for this study (Reference JA 1/4/5). Participation was voluntary, and anonymity and confidentiality was assured. All participants received written and oral information before informed consent was obtained.

**Sample**

Purposeful and theoretical sampling was used. All fulltime nurses working in the perioperative area were invited to participate in the study. Nursing students, nurses on a perioperative programme or those who did not work full-time were excluded.

**Data Collection**

Data was gathered through unstructured interviews and non-participant observations. Invitation flyers were circulated at a national perioperative conference and at a regional hospital complex. 39 people responded and volunteered to take part in one to one interviews from 11 different hospitals. Initially 39 nurses expressed interest to partake in the study and eventually 37 participated at a venue time and place identified by the participant. All participant met the inclusion criterion. Also, 33 hours of non-participant observations was undertaken in 11 different hospital settings in Ireland. Data were collected using theoretical sampling and analysis was carried out concurrently.

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Following ethical approval an information letter about the proposed research was sent to all perioperative clinical managers in the different hospitals with a request to display it where nurses could see it. Once participants made contact with the researcher further details about involvement in the study was given. Interview date, time and venue of choice was organised. Written consent was obtained prior to interviews. Anonymity and confidentiality was assured by using numbers instead of names. Interviews varied in length between twenty five and ninety minutes. Each interview commenced with an open-ended question ‘What is your main concern when working in the perioperative setting?’ As the initial concepts emerged, further questions were guided by theoretical sampling where the emerging theory and concepts determined the questions to be asked. Memos were written whenever and wherever ideas occurred on the emerging theory. Memos contributed to raising the level of abstraction and conceptualising of the data in advancing the emerging theory (Glaser 1978). Interviewing concluded when ideas were repeated and data were saturated (McCallin 2011). Saturation of categories occurred when no new properties emerged for the core concept and sub core concepts.

Permission to carry out non-participant observation for this study was granted through the by the relevant CNMs. On arrival in the perioperative setting on the pre-arranged date, permission was again requested and confirmed with the CNM. Following introductions, a synopsis of the research was given to staff. The findings from non-participant observations were consistent with the patterns of behaviour already emerging and coded from the interviews. The non-participant observations were used to verify and saturate categories.

Data analysis
Data analysis followed the classic grounded theory method described by Glaser (1978) using open and selective coding, constant comparison and memoing (O’ Brien, 2018). All interviews were transcribed verbatim then analysed manually by the first author (BOB) and open coding commenced using line by line in vivo coding looking for patterns of behaviour and concepts. Invivo codes were used initially, but as coding progressed and using constant comparison, similar behaviours were recoded, resulting in increasing conceptualisation. Once the core category emerged, then coding became selective (Figure 1). Memoing was used throughout the data analysis process which was key to theory generation. Theoretical coding as originated by Glaser (1978) was used as a framework to organise the theory and suggest relationships between the categories. The predominant theoretical code used was the Strategy Family (Figure 2).
Figure 1. **Example of Concepts and Sub Categories Within Orchestrating**

- Providing direct care
- Maintaining own work
- Depending on others
- Doing delegated task
- Being Informed
- Keeping people in the know
- Verbally checking
- Listening to instruction
- Organising theatre workloads
- Allocating daily activities
- Skill matching
- Giving direction
- Organising surgical lists
- Coordinating surgical skills
- Maintaining safety
- Delegating tasks
- Providing direct care
- Maintaining own work
- Depending on others
- Doing delegated task
- Organising theatre workloads
- Allocating daily activities
- Skill matching
- Giving direction
- Organising surgical lists
- Coordinating surgical skills
- Maintaining safety
- Delegating tasks
### Figure 2. Audit Trail of a Code

<table>
<thead>
<tr>
<th>The Audit Trail of a Code</th>
<th>Keeping people in the know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invovo codes/open Codes</td>
<td>Being informed</td>
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<tr>
<td></td>
<td>Reading notes</td>
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<td></td>
<td>Recording information</td>
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<td>Sourcing information</td>
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<td>Listening to instruction</td>
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<td></td>
<td>Giving instruction</td>
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<tr>
<td></td>
<td>Getting and giving feedback</td>
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<td></td>
<td>Verbally documenting counts</td>
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<tr>
<td></td>
<td>Constantly giving information</td>
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<tr>
<td></td>
<td>Informing one another</td>
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<td>Talking with people</td>
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<td>Listening to monitors</td>
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<td></td>
<td>Sharing knowledge</td>
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<td>Verifying instruction</td>
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<td></td>
<td>Talking together</td>
</tr>
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<td></td>
<td>Speaking with patient</td>
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</tbody>
</table>

### Connection to Selective Coding
- Conceptualised to being in the know

### Connection to Category
- Being in the know explained as a dimension of orchestrating

### Connection to Core Concept
- Orchestration is a category of anticipatory vigilance (core concept of main study)

### Connection Core Category
- Being in the know is a dimension of orchestrating, which is a category of anticipatory vigilance which minimising risk in the perioperative setting

### Theoretical Codes
- The strategy family was the prominent theoretical code used to organize the theory and offered options for the integration of substantive codes, categories and their relationships to the core concept and core category.

### Results

Over 500 open and invivo codes were identified for each category and memos were written allowing the conceptual development of the theory. By integrating codes, the core variable and its categories emerged explaining the main behaviour of nurses working in the perioperative setting. Through the constant comparison process, the concept of Orchestrating was central and reoccurring within the data.

Orchestrating explains how risk is minimised in the perioperative setting and consists of four categories: macro orchestrating, locational orchestrating, situational orchestrating and being in the know which are co-dependent and concurrent. It involves effective planning, delegating, co-ordinating and communicating. Orchestrating aims to increase positive patient outcomes through the effective managing, pacing and timing of how work is done.
It is a continuous process occurring throughout a twenty four hour staff rota, seven days a week.

**Macro Orchestrating**

Macro orchestrating is an appointed authoritative role reserved for a particular person within the workplace. This is how work and daily activities are allocated in managing the daily routing of the perioperative setting. It involves the planning, organising and coordinating finances, staffing and resources within the perioperative area.

Several participants commented:

Clinical Nurse Managers 3 are required to be good planners; co-ordinators, organisers and a delegators ensuring tasks are assigned in a safe, responsible manner” (Participant 25).

Work is organised within the department through overseeing and delegating teams to perform tasks, thus ensuring that risk is minimised and patients have a safe and successful surgical experience. One participant said:

First thing in the morning I check the theatre list, the number of staff allocated to our theatre and the estimated time it will take to work through the surgical cases (Participant 13).

Macro orchestrating is essential for management and involves accountability and responsibility and is used for preplanning It also involves supervising nursing and ancillary/healthcare support workers staff through the delegation of tasks and roles. It ensures that work is allocated to people fairly so that it is equal and manageable across staff in the department. Effective macro orchestrating is the basis for locational orchestrating and situational orchestrating. Macro orchestrating provides the structural basis for minimising risk.

**Locational Orchestrating**

This involves a named nurse organising workloads when managing staff in one operating room in the perioperative setting. This role can be a short-term or permanent management position. It consists of managing and co-ordinating surgical lists within an individual operating room, co-ordinating small numbers of staff, scheduling surgical procedures and overseeing all staff performance. The role is normally undertaken by a CNM 2 or CNM 1.

One participant said:

A CNM2 or CNM1 generally manage an individual theatre. Their role is to organise their team and manage workloads (Participant 29).

Locational orchestrating relies on collegial support and understanding individuals’ capabilities, strengths and limitations through establishing trusting relationships. Its function is to provide a structure for maintaining safety within a macro environment. Roles are assigned and specific tasks delegated. This encourages staff to take responsibility and be accountable for their actions. The allocation of roles is normally an informal arrangement based on mutual agreement, however, this may become a formal instruction.
when an unexpected event occurs as specific tasks need to be undertaken quickly to reduce the risk of error. One participant commented:

If I am allocated to check the anaesthetic machine, I have to check the gasses, equipment, suctioning etc. in connection with the machine. This is a critical responsibility; the buck stops with me is something is wrong (Participant 18).

Management of unexpected events are normally dealt with effectively through locational orchestrating by identifying a team member who can deal successfully with the situation at hand.

Situational Orchestrating
Through Situational orchestrating individuals organise and manage the work they were allocated during locational orchestrating. They assume responsibility for different tasks such as setting up sterile trolleys, scrubbing for a surgical procedure as well as carrying out a task in a specific and systematic manner. One participant commented that:

Usually the CNM2 in charge of the theatre works with the team she has been given and appoints or delegates different surgical cases or jobs to different nurses. This depends on the workloads of the day and the experience of the nurses at hand (Participant 20).

Situational orchestrating is co-dependent with macro orchestrating and locational orchestrating as it is both a delegated and temporary role. Working with team members on an assigned task facilitates and encourages mutual watching to identify and minimise potential risk. One participant said:

All staff are dependent on each other and a person needs to trust and feel safe with co-workers (Participant 3).

Situational orchestrating is necessary for the smooth running of activities that contribute to good quality care. Individuals are delegated responsibility for a particular task consistent with their level of expertise. Situational orchestrating provides structural support for the safe care of individual patients.

Being in the Know
Being in the know involves being informed and being aware of what is happening. It enables nurses to know and understand what is occurring and is reliant on appropriate and timely communication with all team members. Being in the know is a continuous and evolving communication practice. One participant said:

We all need to know what is going on around us and good communication between colleagues enable this. Things change quickly and continually in the perioperative setting so one needs to know what is going on so that change can be dealt with (Participant 7).

Verbal and nonverbal communication helps to form trusting relationships where information is given and received, and acted on as necessary. Being informed helps to sustain and foster a safety culture. One participant commented:
When we trust one another, we tell one another different things, so if we know anything about anything we share the information so we all know what is happening (Participant 30).

Being in the know facilitates orchestrating at all levels through providing varying types of information on people, patients and activities within the department. It underpins the promotion of safe and quality care. It is enhanced by documenting the care provided by nurses as it provides a written record of nurses’ contribution to the care given during the surgical experience.

**Discussion**

Orchestrating is a strategy used by nurses to supervise and manage staff and activities in the perioperative setting to minimise risk and promote the safe management of patients. The Provision of a safe environment requires co-ordinating the diverse skill mix of numerous personnel (Rothrock 2019). This is described in the literature as organisational management (Sullivan 2017). It consists of planning organising, directing and controlling (Sullivan & Garland 2010). Organising is how work is coordinated and incorporates recognising the work of the organisation, dividing the workload, creating the chain of command and assigning responsibility (Sullivan 2017). Directing is the method for guiding the work within the workplace through instruction and coordinating activities (Sullivan & Garland 2010). Planning, organising and directing are an active approach to organisational management (Sullivan 2017). Planning, organising and directorship are addressed within orchestrating by the person who undertakes the role of macro orchestrating and locational orchestrating.

Leadership plays a vital role at each level of effective management (Sullivan 2017). This spans diverse groups from, top-level managers (e.g. healthcare organisation senior managers/chief executive officers) at a strategic level to middle managers (e.g. heads of clinical units) and team leaders (World Health Organisation, 2009b). This is consistent with the key roles identified within macro orchestrating, locational orchestrating and situational orchestration respectively which are key to promoting safety.

Macro orchestrating is consistent with top-level management, which ensures the smooth and safe management of the operating theatre. It is consistent with effective and efficient planning, delegating, co-ordinating and communicating. Managers need to focus on frontline performance, when planning, delegating, organising and scheduling workloads while identifying staff to maximise operational efficiency in promoting safety. Planning is required at both organisational and personal levels that answers the questions of what, why, where, when, how and by whom (Sullivan 2017). Delegating workloads and tasks is explained by macro orchestrating where team members are empowered through locational orchestrating whereby responsibility is shared. A leadership role is acknowledged as a position of power and authority. It involves leading others by offering direction and coaching whilst understanding and considering the roles and needs of others (Mitchell et al. 2011). Typically the perioperative unit is lead at CNM 3 level and individual operating rooms are managed by a lead nurse at CNM2 level. Nurse Managers within the perioperative setting manage and coordinate multiple, complex situations (Hussey et al. 2011). The key roles of the CNM3 include staff rostering, coordinating patient throughput, scheduling procedures and resources, as well as monitoring the performance of nurses and workload in the operating room (Marjamaa & Kirvela 2007). Effective organisation and planning conceptualised as orchestrating are fundamental to reducing error and adverse events.
Locational orchestrating is consistent with middle management emphasises the smooth and safe management of a specific operating room, while situational orchestrating is consistent with lower management, which facilitates nurses in minimising risk. It involves leading, managing and co-ordinating staff. The World Health Organisation (2011) recommends that efficient and effective leaders co-ordinate and facilitate teamwork by delegating tasks, conducting briefs and debriefs, resolving conflict, empowering team members, incorporating training for staff and balancing the workloads of staff. Within locational orchestrating tasks are delegated and overseen in order to minimise risk. Being able to influence a team is a key leadership skill (Cameron 2011). Silén-Lipponen et al. (2005) highlight that management improves safety by assigning experienced staff to each team. Locational orchestrating promotes safety and endeavours to ensure that risk is minimised.

Situational orchestrating is consistent with lower management whereby a staff nurse is given responsibility to organise and undertake a task or an action. Near misses are observed and managed through situational orchestrating as the individual is alert to and recognises potential error and takes the necessary steps to rectify or offset the situation. Near misses, errors and adverse events are recognised, addressed, assessed, and managed through corrective measures based on a risk and safety policy and guidelines (Silvestre de Lima et al 2018). Whilst situational orchestrating is enacted to minimise risk, staff are still reliant and co-dependent on other team members in carrying out the work safely.

Within orchestrating an aspect of communication is conceptualised as being in the know which is fundamental in promoting safety and minimising risk. Communication and delegation are fundamental to leadership roles (Sullivan 2017, Sullivan & Garland 2010). Being informed is vital to enable the smooth organisational management of the perioperative area and is conceptualised as being in the know in this study. It explains how staff undertake their roles in the perioperative setting. Perioperative nurses need to engage in communication with team members for the coordination of activities through clearly explaining what they require, maintaining eye contact and listening to what is being requested of them (Rothrock 2019). Perioperative nurses facilitate communication between health care professionals to enhance patient outcomes (Association of periOperative Registered Nurses 2018). Poor communication may result in error (Hussey et al. 2011). Good communication enables efficient perioperative practice as nurses are continually kept informed of what is occurring and what has occurred. Communication that is timely, accurate, complete, explicit and understood reduces error thus improving patient safety (Amato-Vealey et al. 2008). Being in the know ensures that nurses are more aware of their surroundings and more responsive to what is going on through verbal and non-verbal communication which supports minimising risk of errors in the perioperative setting.

Greenberg et al. (2007) studied the entire spectrum of surgical care identifying communication breakdowns as a major cause of error, especially where communication with other caregivers is ambiguous about responsibilities. Being in the know adds to the current literature on promoting safety as it explains its key role in linking all aspects of orchestrating together in minimising risk. Gawande et al. (2003) identified failures in communication and vigilant behaviour as making adverse events more likely to occur. Being in the know suggests that effective communication is essential for staff to be kept well informed and updated on situations that are unfolding, so that good quality care is given safely.
Being in the know results from good collaborative communication which ensures that information has been processed. The literature is consistent with this and identifies that communication is generally carried out intentionally and overtly whereby information is intentionally conveyed to another (Hargie 2011). For effective communication to occur both the communicator and the addressee must work together by performing the communication and interpreting the information given (Sperber et al. 2010). Being in the know provides information to people about what they are dealing with at a given time. This is supported by Brizon & Wybo (2006) who describe three rules within organisational management to support vigilance within an organisation. The first rule is that people are informed about potential risks such as medical allergies and patients with similar names. The second rule seeks out information from all the system’s members, as they are the individual observers of danger precursor signals. The third rule states that cause must be processed before consequences. Within the perioperative setting patient information and sequencing of the surgical list is shared within the surgical team between nurses, anaesthetists, surgical doctors and surgeons. This is critical to being in the know where the importance of communication and receiving information are identified as being essential in minimising risk and promoting safety. The use of a surgical safety checklist is valuable in promoting communication between interdisciplinary teams and is fundamental to providing information. It encourages information exchange and team unity (World Health Organisation 2008a).

Limitation and Recommendation for future studies
The study focused on qualified perioperative nurses only. Theoretical sampling across broader health care personnel may have generated different findings.

There is a critical need for a larger research study in the perioperative area looking at how management approaches impact and affect safety.

Implications for Nursing Supervision
This research explains how managers and nurses promote safety through minimising risk in a high risk environment thus creating greater awareness. It provides understanding of the challenges and complexities of reducing risk in the perioperative setting.

Greater attention needs to be paid by managers to the structures, supports and processes that affect where they work as effective management practices are essential. Globally, managers and staff nurses within the perioperative setting must endeavour to organise workload to maximise patient safety by minimising risk in the surgical journey. This study suggests that education and training regarding safety and leadership within the perioperative workplace is essential as Orchestrating contributes to promoting safety. Effective management structures and support systems are essential in promoting a culture of safety in perioperative setting.

Conclusion(s)
Fostering a culture of safety is essential in the perioperative setting. A risk aware culture requires good leadership, effective management at macro and micro levels, understanding, awareness, knowledge and effective communication. Managers at all levels play a key role in ensuring that structures and processes are in place so that safety can be maintained. The findings of this study suggest that minimising risk within the perioperative setting is managed through Orchestrating which consists of macro orchestrating, locational orchestrating and situational orchestrating, all facilitated by being in the know. Orchestrating provides a new approach to promoting safety and

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minising risk in the perioperative setting. While the literature generally discusses management in terms of effective management, this is the first study to link effective management to patient safety. Understanding the strategy of orchestrating offers a comprehensive explanation and understanding of how nurses in the perioperative setting ensure that error and adverse events are minimised. Orchestrating suggests how roles and responsibilities can be effectively delegated to all nurses, while encouraging individual responsibility and good teamwork in promoting patient safety.

References


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