

Beyond clinical priority: what matters when making operational decisions about emergency surgical queues?

Anneke Fitzgerald^{1,2} PhD, Professor

Yong Wu¹ PhD, Senior Lecturer

¹Department of International Business and Asian Studies, Griffith University, Gold Coast Campus, Qld 4222, Australia. Email: yong.wu@griffith.edu.au

²Corresponding author. Email: anneke.fitzgerald@griffith.edu.au

Abstract

Objective. This paper describes the perceptions of operating theatre staff in Australia and The Netherlands regarding the influence of logistical or operational reasons that may affect the scheduling of unplanned surgical cases. It is proposed that logistical or operational issues can influence the priority determination of queue position of surgical cases on the emergency waiting list.

Methods. A questionnaire was developed and conducted in 15 hospitals across The Netherlands and Australia, targeting anaesthetists, managers, nurses and surgeons. Statistical analyses revolved around these four professional groups. Six hypotheses were then developed and tested based on the responses collected from the participants.

Results. There were significant differences in perceptions of logistics delay factors across different professional groups when patients were waiting for unplanned surgery. There were also significant differences among different groups when setting logistical priority factors for planning and scheduling unplanned cases. The hypotheses tests confirm these differences, and the findings concur with the paradigmatic differences mentioned in the literature. These paradigmatic differences among the four professional groups may explain some of the tensions encountered when making decisions about scheduling emergency surgical queues, and therefore should be taken into consideration for management of operating theatres.

Conclusions. Queue positions of patients waiting for unplanned surgery, or emergency surgery, are determined by medical clinicians according to clinicians' indication of clinical priority. However, operating theatre managers are important in facilitating smooth operations when planning for emergency surgeries. It is necessary for surgeons to understand the logistical challenges faced by managers when requesting logistical priorities for their operations.

What is known about the topic? Tensions exist about the efficient use of operating theatres and negotiating individual surgeon's demands, especially between surgeons and managers, because in many countries surgeons only work in the hospital and not for the hospital.

What does this paper add? The present study examined the logistical effects on functionality and purports the notion that, while recognising the importance of clinical precedence, logistical factors influence queue order to ensure efficient use of operating theatre resources.

What are the implications for practitioners? The results indicate that there are differences in the perceptions of healthcare professionals regarding the sequencing of emergency patients. These differences may lead to conflicts in the decision making process about triaging emergency or unplanned surgical cases. A clear understanding of the different perceptions of different functional groups may help address the conflicts that often arise in practice.

Received 22 December 2015, accepted 29 June 2016, published online 29 August 2016

Introduction

An unplanned surgical case refers to the situation where a person who has presented to hospital (usually via the emergency department) needs to undergo a procedure that requires attention within the next few minutes, hours or day. In operating theatres around the world, decision making about triaging emergency or unplanned surgical cases is a concern, because the result of such

a process can directly affect the efficient and effective utilisation of operating theatres.

For example, Canadian researchers found the management of waiting lists to be as important as clinical triage when determining wait times for unplanned surgical cases.¹ In the UK, Hadley and Forster reported that emergency operating theatre lists were compiled in an extemporised manner, which calls for daily

improvisation.² Equally, there are reports in Australia on the lack of standardised procedures affecting operating theatre efficiency.^{3,4} Therefore, research in different hospitals shows that the scheduling of emergency surgery is often an unstructured, non-standardised process.

Surgeons play a large role in determining queue priority. Many writings about scheduling concentrate on clinical decision making. Nevertheless, this clinical decision making takes place in a complex system; for example: 'Ultimately the key to success is not so much how you triage the urgent cases but making sure the block scheduling system is functional so surgeons trust it and don't abuse it'.⁵ This quote also signifies the potential friction when vying for queue position for individual patients and indicates that the system is, on occasion, used by surgeons in a way that could cause conflict between clinical and managerial demands.

Surgeons are not necessarily ignorant of the tensions caused by their individual requests to operate on their patients first. Surgeons admit to sometimes being less clear about a clinical priority, resulting in the surgeons influencing their patient's queue position based on preference rather than priority.⁶ Such demands on placing their patients first in the queue are difficult for operating theatre managers to negotiate because the reliance upon surgical determination of clinical priority remains paramount.

Tensions about the efficient use of operating theatres and negotiating individual surgeon's demands are further compounded by the notion that in many countries surgeons work in the hospital rather than for the hospital.⁷ This also appears to be the case in Australia, where many, if not most, surgeons are paid a 'fee for service' and serve public patients in public hospitals as *visiting* medical officers, which supplements their private practice. Thus, it is understandable to assume that organisational (in)efficiencies may not necessarily be a concern for them. However, organisational (in)efficiencies are a concern for operating theatre managers, who are responsible for managing theatre flow and all visiting medical officers' patients.

It is natural to conclude that the different perspectives of surgeons and managers can cause tensions that potentially affect the business of health. Hoffer Gittel pointed out that task silos can occur when a focus on role task performance excludes interdependence with other providers, which is important for coordination and cohesion.⁸ This is consistent with the contention that there are paradigmatic differences in a hospital⁷ and, in order to keep the hospital efficient, professional and functional perspectives must be balanced.⁹ In an effort to balance these perspectives, Glouberman and Mintzberg proposed four paradigms in a two-by-two matrix: community, control, cure and care.⁹ Surgeons supposedly occupy the cure paradigm and managers occupy the control paradigm, indicating that surgeons and managers have diametrically opposed perspectives.⁷ Although these opposing positions is an explanation for the conflict experienced by operating theatre staff (i.e. surgeons, nurses, managers and anaesthetists), little empirical work has been done to underpin existing tensions between surgeons and managers. Furthermore, little empirical work has been done to explain the potential tensions between clinicians and managers from the logistical perspective in determining queue position of emergency surgery cases.

Therefore, the aim of the present study was to investigate the notion that logistical or operational issues can influence the

priority determination of queue position of surgical cases on the emergency waiting list. Because it is believed that tensions are caused by different groups (i.e. surgeons, anaesthetists, nurses, managers, non-managers) having a different focus,^{7,9} the following three hypotheses were proposed (and tested) in terms of the perceptions of logistical delay factors: (1) Hypothesis 1A, the perceptions of logistical delay factors are different between managers and non-managers; (2) Hypothesis 1B, the perceptions of logistical delay factors are different between doctors and non-doctors; and (3) Hypothesis 1C, the perceptions of logistical delay factors are different among different occupational and professional groups.

In a similar vein, logistical priorities will have direct effects on the planning and scheduling of unplanned surgeries. Priorities set by different groups, when they are different, will likely cause tensions among different groups. Therefore, it is desirable to see whether there are differences about logistical priority settings among the different groups. Hence, the following hypotheses were proposed (and tested): Hypothesis 2A, the logistical priorities set by managers are different to those set by non-managers; (2) Hypothesis 2B, the logistical priorities set by doctors are different to those set by non-doctors; and (3) Hypothesis 2C, the logistical priorities set by different occupational and professional groups are different.

Methods

Participants

The participants in the present study were recruited from 15 hospitals, of which eight were in Australia and seven were in The Netherlands. In order to examine the potential differences in perceptions and priority setting for logistical factors, participants were classified into four groups (surgeons, anaesthetists, nurses and managers) depending on their particular roles in operating theatres. This is aligned with the view that tensions usually arise among different groups due to the different focus of each group.^{7,9} Stratification in the four different occupational and professional roles will facilitate the investigation as to whether the perceptions of logistical delays and logistical priority settings (see below) are different among surgeons, anaesthetists, nurses and managers.

To further explore whether managerial role affects the perceptions of logistical delay factors and logistical priority settings, the participants were split into two general groups according to their managerial roles: managers and non-managers. Similarly, participants were classified into groups of doctors and non-doctors according to their professional roles, to investigate whether doctors (who have a pivotal role in surgeries) have different perceptions of logistical delay factors and logistical priority settings. The 'doctors' group included both surgeons and anaesthetists, whereas the 'non-doctors' group included nurses and managers.

Variables considered

An anonymous questionnaire, which consisted of both open-ended and Likert scale questions, was used for data collection. Questions contained in the questionnaire included perceived frequency of a set of logistical delay factors and the importance of a set of logistical priority-setting factors. The questionnaire was developed through prior exploratory research and was

refined by clinicians in a multicentre pilot study.^{4,10–12} In all, 15 logistical delay factors and 19 logistics priority setting factors were incorporated into the questionnaire. In order to facilitate the statistical analysis in manageable categories while accepting the fact that some factors may be highly correlated with each other, these items were grouped into disjoint categories using common knowledge and similarities among variables. Principal component analysis (PCA) was then used to check whether the variables in one group could be explained by one factor, as a way of verifying that the groupings of variables were valid. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett’s test of sphericity, among other assumptions, were used to check the useability of PCA. Confirmatory factor analysis (CFA) and Cronbach’s α were subsequently used to test the construct validity and the within-group internal consistency respectively. Once all these test results were acceptable, for each participant, we took the arithmetic mean of all variables within a particular group to represent the participant’s rating for that group. That is, variables were classified into groups to facilitate further statistical analysis at an aggregated level.

Logistical delay factors

From a business process point of view, an operation will need operators (surgeons, anaesthetists and nurses), inputs (patients) and resources in order to generate the outputs (the surgeries can be performed). Any delay in any of these areas can block the surgery from proceeding. Therefore, all participants were asked about how often delays in scheduling emergency surgery were related to staffing issues, resource issues (e.g. lack of theatre space) and patient factors (e.g. poor preparation). These factors concur with the findings in the literature about the common reasons for delays.¹³ Specifically, participants were asked to rate their perceptions of general delays in scheduling unplanned surgical cases on a Likert scale from 0 to 9, where 0 indicated no delays and 9 indicated delays happened all the time.

These items were then grouped into three areas for investigation: (1) waiting for staff; (2) waiting for resources; and (3) waiting as a result of patient factors. These three areas were used in the present study to facilitate the description of logistical delay factors in the questionnaire.

The first area for investigation was waiting for staff, which included waiting for a particular type of profession, such as surgeons, anaesthesia staff members, nurses and other staff members. Surgeons, anaesthetists and nurses were specifically singled out because they are the direct participants in surgeries. The second area for investigation was waiting for resources, which related to factors such as theatre or space availability, waiting for elective surgery to finish, waiting for surgical instruments, waiting for a ward bed or a bed in the intensive care unit (ICU), waiting for a patient to be transported and other resources. These factors were used because they are the most common delay factors observed in operating theatres.¹³ The third area for investigation related to waiting for patient factors, which included waiting for surgical preparation to be completed, waiting for access to patient investigations, waiting for patient documentation to be completed and other patient factors.

Logistical priority settings

Logistical priority settings are likely to affect the position of unplanned surgeries in the queue. In the survey, participants were asked to rate the importance of selected logistical items using a nine-point Likert scale, where 1 indicated the highest priority and 9 the lowest priority, including availability of staff, materials and resources and responding to explicit wishes from different staff, patients or patient families. Similarly, these items were grouped into four logistical priority factors: (1) variables directly related to individual sanction; (2) variables directly influenced by command issues; (3) variables not directly influenced by sanction or command; and (4) variables that indicate capacity for surgery. Again, they are used in this study to facilitate the description of variables that were used in the questionnaire.

The first group of variables are directly influenced by individual sanction, such as responding to the opinions of operating theatre staff (including anaesthetists, nurses and surgeons). If higher priorities are set to this group of variables, then it means that clinicians (anaesthetists, nurses and surgeons) will have more say in determining the unplanned surgery queue position.

The second group of variables are those that are directly influenced by command issues. These include responding to a patient’s opinion, the status of medical insurance, whether the consent process is completed, previous delayed surgery, the duration of surgeon waiting on-site and the duration of patient waiting on-site.

The third group of variables includes variables that are neither directly influenced by sanction nor by command. These include waiting for other support services, whether the patient is a staff member or family or friend at the hospital and the time of the day.

The fourth group of variables includes those that indicate capacity for surgery, such as availability of anaesthetists, appropriate surgical staff, scrub nurses, preferred instruments or equipment, ICU beds and ward beds.

Procedure

As mentioned earlier, the survey was conducted via an anonymous questionnaire, which was in both English and Dutch. Both languages were used to dissolve any possible confusion between terminologies and translations because most participants in The Netherlands can read English. Although predominantly a closed-answer survey using Likert scales, the questionnaire also invited participants to extend responses regarding scheduling practices and difficulties encountered.

The study was conducted from 2003 to 2004. A hospital site coordinator was appointed for each participating hospital to assist with data collection. In Australia, this appointment was directed by senior personnel within each hospital. In The Netherlands, a research assistant was appointed to this role. The hospital site coordinators remained on-site for at least 1 week and recruited participants in operating theatres, including surgeons, anaesthetists, nurse managers, day-to-day floor managers and administrators, on a voluntary basis. Once a participant accepted the research invitation, they were asked to complete the anonymous questionnaire for the study.

Data analysis

Data analysis was based on the categories of variables discussed above, where the groupings were results of using common knowledge, PCA, CFA and Cronbach’s α , as discussed earlier.

Differences in survey responses from nurses, managers, anaesthetists and surgeons for the constructed factors were analysed. One-way analysis of variance (ANOVA) was used to identify whether there were significant differences among groups regarding these constructed factors. Although *t*-tests can be used when there are only two groups to be compared, we used one-way ANOVA in such cases to make the reporting of statistical results consistent. Post hoc Games–Howell analysis, which allows for unequal sample sizes among groups and different population variances, was used for pair-wise comparisons when the ANOVA models showed significant between-group effects.

Results

Overview of responses

Overall, 342 responses were received. However, five responses were excluded because they indicated unreasonable responses to the survey (e.g. waiting times of over a month). Among the valid 337 respondents, 169 were from Australia and 168 were from The Netherlands. The distribution of respondents across discipline groups and countries is given in Table 1. In total, there were 135 surgeons (including surgeons, surgeon trainees and surgeon registrars; approximately 40.1% of total respondents), 85 anaesthetists (25.2%), 39 managers (11.6%) and 78 nurses and technicians (23.1%).

Perceptions of logistical delays

Table 2 lists the logistics delay factors and the corresponding questions asked in the questionnaire, followed by Cronbach’s α and the mean \pm s.d. for each factor. Cronbach’s α for the factors ranged from 0.70 to 0.80, which is more than satisfactory in this case and exceeds the recommended cut-off point of 0.70.^{14,15}

Generally, respondents agreed that logistical factors can delay emergency surgical cases. As indicated in Table 2, overall, waiting for resources causes most delay, followed by waiting for patient factors, with waiting for staff causing least delay.

One-way ANOVA was used to determine the significance of differences in the way the four groups perceived logistical delay factors. To align with the hypotheses we proposed, the respondents were grouped as (1) managers and non-managers, (2) doctors and non-doctors and (3) surgeons, anaesthetists, managers and nurses.

Table 3 reports the sample mean and sample standard deviation of the different groups from the one-way ANOVA.

Perceptions of delays by managers versus non-managers

As indicated in Table 3, managers reported they experienced more delays when waiting for staff compared with non-managers, but the difference was not significant ($P = 0.212$). Non-managers indicated they experienced slightly more delays when waiting for resources than managers, but again the difference was not significant ($P = 0.954$; Table 3). ANOVA indicated a significant

Table 1. Distribution of disciplines per country

Position	Australia	The Netherlands	Total
Surgeon	69	40	109
Surgeon trainee/registrar	14	12	26
Total surgeons	83	52	135
Anaesthetist	35	27	62
Anaesthetist trainee/registrar	13	10	23
Total anaesthetists	48	37	85
Theatre floor coordinator/unit manager	15	9	24
Theatre manager	13	2	15
Total managers	28	11	39
Nurses/technicians	10	68	78
Total	169	168	337

Table 2. Logistical delay factors
ICU, intensive care unit

Factor groups	Logistical delay factors	Cronbach’s α	Mean \pm s.d. of Likert scale
Waiting for staff	Waiting for anaesthesia staff	0.70	2.78 \pm 1.72
	Waiting for surgical staff		
	Waiting for nursing staff		
	Waiting for other staff		
Waiting for resources	Waiting for theatre or space availability	0.74	3.38 \pm 1.61
	Waiting for elective surgery to finish		
	Waiting for instruments		
	Waiting for a ward bed		
	Waiting for an ICU bed		
	Waiting for patient transport		
Waiting for patient factors	Waiting for other	0.80	2.97 \pm 1.67
	Waiting for surgical preparation to be completed		
	Waiting for access to patient investigations		
	Waiting for patient documentation		
	Other patient factors		

difference between the two groups ($P=0.025$) for patient factors, whereby managers experienced significantly more delays than non-managers (Table 3). This may be explained by the division of tasks and responsibilities, with managers ensuring documentation is correct and surgical preparation is complete. When processes are managed well, non-managers (clinicians) do not experience delays.

Perceptions of delays by doctors versus non-doctors

Doctors indicated that they experienced more delays when waiting for staff than non-doctors, but the difference was not significant ($P=0.160$; Table 3). Non-doctors indicated that they experienced more delays when waiting for patient factors than the doctors, but again the difference was not significant ($P=0.188$; Table 3). However, ANOVA revealed a significant difference in the waiting for resources factor between doctors and non-doctors ($P=0.001$; Table 3). This may be explained by the division of labour in the operating rooms, where the non-doctor role is largely dedicated to preparation and assistance with cases. Doctors can only go ahead when space is available, and there is a ward bed for their individual case. This delay is then experienced as idle time.

Table 3. One-way analysis of variance (ANOVA) of logistics delay factors

Superscripts indicate the differences are significant ($*P < 0.05$ or $**P < 0.01$) and when necessary letters are used to indicate the pairing, i.e., the same letter is used for any pair when there is a significant difference observed (if bold $P < 0.01$, otherwise $P < 0.05$)

	Waiting for staff		Waiting for resources		Waiting for patient factors	
	\bar{x}	s	\bar{x}	s	\bar{x}	s
Managers	3.10	1.76	3.36	1.78	3.54**	1.94
Non-managers	2.74	1.71	3.38	1.59	2.90**	1.63
Doctors	2.88	1.80	3.60**	1.60	2.89	1.68
Non-doctors	2.60	1.54	2.96**	1.55	3.14	1.66
Surgeons	2.86	1.94	3.55 ^A	1.57	2.56 ^{C,D}	1.59
Anaesthetists	2.91	1.57	3.68 ^B	1.65	3.40 ^C	1.69
Nurses	2.34	1.35	2.76 ^{A,B}	1.39	2.94	1.47
Managers	3.10	1.76	3.36	1.78	3.54 ^D	1.94

Perceptions of delays by surgeons, anaesthetists, nurses and managers

The group comparison revealed that the managers indicated they experienced higher levels of delay for staff and patient factors. The anaesthetists experienced the highest level of delay for resources; and the surgeons experienced the second-highest level of delay for resources.

Figure 1 shows differences across the four functional groups. One-way ANOVA indicated significant differences between the four groups in relation to waiting for resources and waiting for patient factors ($P=0.001$ and $P < 0.001$ respectively), whereas the difference for waiting for staff was not significant ($P=0.066$).

We used Games–Howell post hoc analysis to determine the significance of differences for between-group effects. This analysis identified significant differences between nurses, anaesthetists and surgeons on the waiting for resources factor. Nurses perceived fewer delays than anaesthetists ($P=0.001$) and surgeons ($P=0.001$; Table 3), reinforcing the earlier finding between doctors and non-doctors. When analysing the waiting for patient factors, the Games–Howell test identified differences between surgeons, managers and anaesthetists, whereby surgeons perceived significantly fewer delays than anaesthetists ($P=0.002$) and managers ($P=0.029$; Table 3). This may be explained by the division of labour in the operating theatre, where the non-surgical roles (including that of anaesthetists) are largely dedicated to preparation of, support for and completion of cases. If the roles of the nurses and anaesthetists are performed well, the surgeons should not experience a delay.

Logistical priority settings

Table 4 presents logistical priority setting factors, the questions that were asked about these factors in the questionnaire, Cronbach’s α and the mean \pm s.d. for each factor. Cronbach’s α for variables that are directly influenced by individual sanction, variables that are directly influenced by command issues, variables that are not directly influenced by sanction or command and variables that indicate capacity for surgery are 0.68, 0.70, 0.54 and 0.73 respectively. Although 0.54 is not an ideal value for measuring internal consistency, it is still an acceptable value.¹⁴

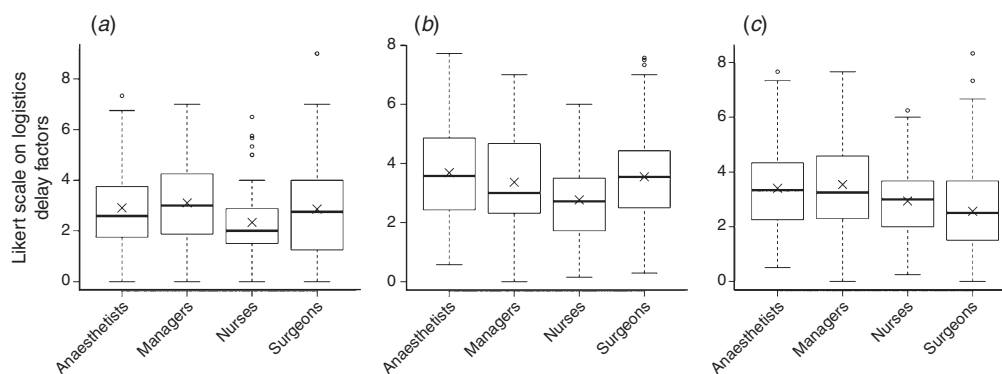


Fig. 1. Boxplots for logistics delay factors across the four occupational groups: (a) waiting for staff; (b) waiting for resources; and (c) waiting for patients. Boxes show the interquartile range, with the median value indicated by the horizontal line and the mean value shown by an “X”. Whiskers indicate minimum and maximum values and outliers are indicated by open circles.

The remaining three values of Cronbach’s α are either close to or exceed 0.70, which is the recommended cut-off point.¹⁵

Table 4 indicates that higher priority is awarded to variables that are directly influenced by individual sanction as well as variables that indicate capacity for surgery. Responding to individual wishes and availability of resources were most important when deciding queue placement. This may explain the conflict that can arise between stakeholders when deciding emergency schedules.^{4,16}

Operational variables that are influenced by command or administrative factors were found to be less important. This can be explained by clinical decision making practices taking precedence when determining queue position of unplanned surgical cases.

As for the logistical delay factors, differences for logistics priority setting factors were investigated between the professional groups using ANOVA (Table 5).

Managers versus non-managers

Operating theatre managers tend to give higher priorities to all factors compared with non-managers (Table 5). For the variables that are directly influenced by individual sanction, this difference is significant ($P=0.011$). For variables that are directly influenced by command issues ($P=0.094$), variables that are not directly influenced by sanction or command ($P=0.413$) and variables that indicate capacity of surgery ($P=0.396$), the differences were not found to be significant (Table 5). This may indicate that managers

Table 4. Logistical priority factors
ICU, intensive care unit

Factor groups	Logistical priority factors	Cronbach’s α	Mean \pm s.d. of Likert scale
Variables that are directly influenced by individual sanction	Responding to anaesthetist opinion Responding to nurses opinion Responding to surgeon opinion Surgical specialist available on-site	0.68	3.39 \pm 1.42
Variables that are directly influenced by command issues	Responding to patient’s opinion Medical insurance status Completing consent process Previous delayed surgery Duration the surgeon has been waiting on site Duration the patient has been waiting for surgery	0.70	5.35 \pm 1.42
Variables that are not directly influenced by sanction or command	Waiting for others support services Staff member or family or friend at hospital Time of the day	0.54	5.03 \pm 1.75
Variables that indicate capacity for surgery	Availability of anaesthetic staff Availability of appropriate surgical staff Availability of scrub nurse(s) Availability of preferred instruments or equipment Availability of ICU bed Availability of ward bed	0.73	3.10 \pm 1.39

Table 5. One-way analysis of variance (ANOVA) of logistical priority factors

Superscripts indicate the differences are significant ($*P < 0.05$ or $**P < 0.01$) and when necessary letters are used to indicate the pairing, i.e., the same letter is used for any pair when there is a significant difference observed (if bold $P < 0.01$, otherwise $P < 0.05$)

	Variables that are directly influenced by individual sanction		Variables that are directly influenced by command issues		Variables that are not directly influenced by sanction or command		Capacity variables	
	\bar{x}	<i>s</i>	\bar{x}	<i>s</i>	\bar{x}	<i>s</i>	\bar{x}	<i>s</i>
Managers	2.85*	1.11	4.99	1.19	4.81	1.92	2.92	1.10
Non-managers	3.47*	1.45	5.40	1.45	5.06	1.73	3.12	1.42
Doctors	3.43	1.46	5.48*	1.44	5.16	1.71	3.21*	1.32
Non-doctors	3.31	1.37	5.11*	1.36	4.77	1.80	2.89*	1.49
Surgeons	3.42	1.49	5.23 ^B	1.48	5.22	1.65	3.25	1.33
Anaesthetists	3.46	1.41	5.85 ^{B,C,D}	1.31	5.08	1.81	3.15	1.31
Nurses	3.56 ^A	1.43	5.18 ^C	1.45	4.76	1.75	2.87	1.67
Managers	2.85 ^A	1.11	4.99 ^D	1.19	4.81	1.92	2.92	1.10

see clinicians, in particular doctors, as definitive stakeholders in their decision making; this would suggest a reliance of managers on clinicians when making decisions. The non-managers (clinicians) perceive themselves as having significantly less influence when casting opinions. This disparity between manager and clinician opinion is consistent with the stakeholder theory of Mitchell *et al.*²⁴ Glouberman and Mintzberg describe paradigmatic differences between managers and clinicians as a horizontal divide, where the divide in mindsets between hospitals containment coalition (managers at all levels) and clinical coalition (doctors and nurses) is evidenced.⁷ These tensions between managers and clinicians have also been described in other studies.^{17,18}

Doctors versus non-doctors

When making decisions about unplanned surgical queues, doctors awarded lower priority to all four factors compared with non-doctors (Table 5). One-way ANOVA indicated that the difference is significant for variables directly influenced by command or administrative issues ($P=0.030$) and the capacity variables ($P=0.045$; Table 5). For variables that are directly influenced by individual sanction, the difference is not significant ($P=0.470$; Table 5). For variables that are not directly influenced by sanction and command ($P=0.059$), the difference is again not significant. This indicates that doctors pay less attention to factors directly influenced by command issues than decision making stakeholders who are not doctors. This disparity between doctor and non-doctor opinion is consistent with the paradigmatic differences between doctors and non-doctors as a vertical divide, where the divide in mindsets between a hospital's status coalition (doctors) and insider coalition (managers and nurses) is evidenced.^{7,19}

Surgeons, anaesthetists, nurses and managers

One-way ANOVA indicated there are differences between the four groups for variables directly influenced by command issues ($P=0.002$). Using Games–Howell post hoc analysis, three differences were observed: (1) between anaesthetists and surgeons ($P=0.008$); (2) between anaesthetists and nurses ($P=0.015$); and (3) between anaesthetists and managers ($P=0.003$; Table 5).

In all cases, anaesthetists expressed significantly lower priority than the other groups. This is an interesting finding in that anaesthetists in an Australian study were found to be intermediaries between the opinions of surgeons, managers and nurses.⁴ The post hoc analysis also indicated that the logistical priority set by the nurses and managers is significantly different ($P=0.024$; Table 5) for the variables that are directly influenced by individual sanction, which could be contributed by the decision making hierarchy and chain of command in the healthcare system.

Of note, we did not find any other significant differences by single professional groupings, as shown in Fig. 2. This means that all professional groups realise that there may not be too much they can do for variables that are not directly under individual sanction or command, whereas for the capacity variables there is a consensus for demanding more resources. This is consistent with the data given in Table 2, where the delay caused by waiting for resources is the most conspicuous and this was confirmed by *t*-test. For pairwise comparisons between waiting for resources and waiting for staff, and between waiting for resources and waiting for patient factors (Table 2), the differences were significant ($P < 0.001$ for both cases).

Summary of findings

The results of the present study provide strong evidence that among the different professional groups, the perceptions of logistical delays and the logistical priority settings are different.

Table 6 summarises the results and shows the test results of hypothesis testing of the hypotheses proposed earlier in the paper. The six hypotheses were tested using one-way ANOVA and taking the average of all related logistical delay factors as the aggregated 'perceptions of logistical delay factors' and, similarly, taking the average of all logistical priority setting responses as the aggregated 'logistical priority settings'. As indicated in Table 6, Hypotheses 1A and 2A cannot be accepted at the $P < 0.05$ level. However, it should be noted that for Hypothesis 2A $P=0.050$. For Hypothesis 1A, although there is no significant difference between the managers and non-managers, Table 3 does indicate that managers perceived more delays about patient factors. The remaining four hypotheses (1B, 1C, 2B and 2C) are accepted, which means that there are

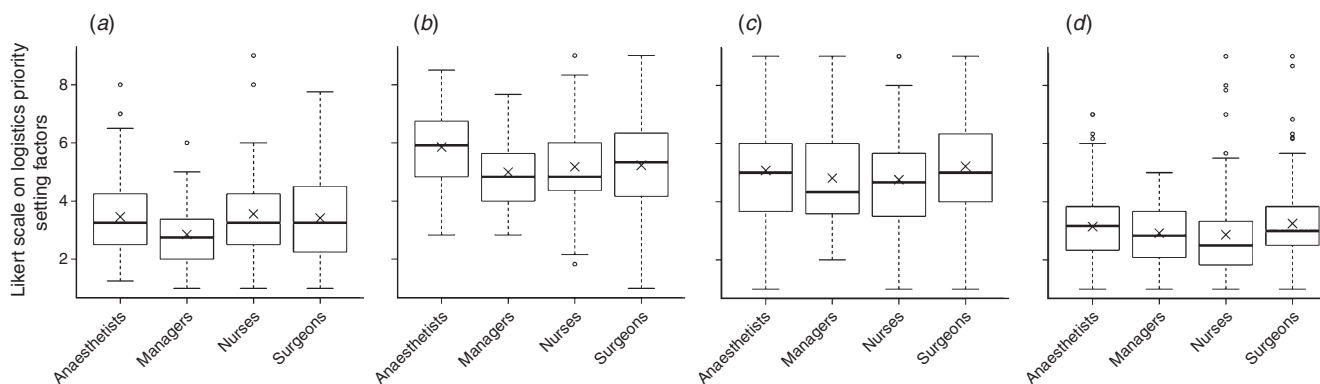


Fig. 2. Boxplots for the logistics priority setting factors across the four occupational groups: (a) directly influenced by individual sanction; (b) directly influenced by command issues; (c) not directly influenced by sanction or command; and (d) indicate capacity for surgery. Boxes show the interquartile range, with the median value indicated by the horizontal line and the mean value shown by an "X". Whiskers indicate minimum and maximum values and outliers are indicated by open circles.

Table 6. Summary of results and the acceptance of the hypotheses
 Hypothesis 1A, the perceptions of logistical delay factors are different between managers and non-managers; Hypothesis 1B, the perceptions of logistical delay factors are different between doctors and non-doctors; Hypothesis 1C, the perceptions of logistical delay factors are different among different occupational and professional groups; Hypothesis 2A, the logistical priorities set by managers are different to those set by non-managers; Hypothesis 2B, the logistical priorities set by doctors are different to those set by non-doctors; Hypothesis 2C, the logistical priorities set by different occupational and professional groups are different

Hypothesis	Accepted?	F-value	P-value
1A	No	$F_{1,327} = 1.275$	0.260
1B	Yes	$F_{1,327} = 3.895$	0.049
1C	Yes	$F_{3,325} = 4.124$	0.007
2A	No	$F_{1,317} = 3.858$	0.050
2B	Yes	$F_{1,317} = 7.526$	0.006
2C	Yes	$F_{3,315} = 3.041$	0.029

significant differences in the perceptions of logistical delay factors and logistical priority settings between doctors and non-doctors, and among all four professional groups.

Discussion

The present paper investigated the perception of the influence of logistical or operational reasons that may affect the scheduling of unplanned surgical cases and priority determination of queue position of surgical cases on the emergency waiting list among different groups of clinical professionals. A clear understanding of the different perceptions may help address the conflicts that often arise in practice. As indicated by the results, differences exist in the perceptions of healthcare professionals regarding the sequencing of emergency patients. These differences may lead to conflicts in the decision making process about triaging emergency or unplanned surgical cases. These differences are discussed below, and practical implications are provided.

As noted earlier, scheduling of emergency surgery is often an unstructured, non-standardised process. Attempts have been proposed to standardise practice by creating scheduling guides or triage tools in order to reduce the impromptu scheduling of unplanned surgical cases. For example, Fitzgerald *et al.* devised a triage tool for improving dialogue about queue position on emergency theatre lists based on clinical decision making.⁴ Another example is the algorithm developed by the Lutheran General Hospital (Chicago, IL, USA) to provide guidelines for the scheduling of emergency surgery cases.²⁰ This algorithm was based on the idea that all surgeons should have equal access to the operating theatre for their emergency surgery. To achieve this, the hospital stated that emergency declaration misuse by surgeons will be addressed individually;²⁰ at the same time, this indicates that surgeons misused the system on occasion.^{5,6}

The findings of the present study echo findings reported earlier that, in the healthcare sector, different occupational and professional groups have different views. For example, Hunter pointed out that the differences between clinicians and managers are obvious and discussed the need to put more clinicians in managerial positions.²¹ In general, most agree that there is fundamental disparity, in the minds of clinicians, about healthcare managers' view and the management of hospitals and

practitioners.¹⁷ Glouberman and Mintzberg suggested analysing hospitals by dividing professional paradigms into quarters,⁷ with a horizontal divide between managers and clinicians. Managers at different levels form a containment coalition whose role is to control resources. This may limit the resources clinicians often claim to need to provide best care. Hence, tension is caused between managers and clinicians as a result of the pressure to contain costs and the pressure to provide best care.

The differences in perceptions of logistical delay factors between doctors and non-doctors seem to support the horizontal divide proposed in the literature.⁷ Doctors experienced more delays than non-doctors, except for delays associated with patient logistics. However, doctors tended to give lower priority to the priority factors identified, especially for variables directly influenced by managerial issues and capacity variables. This is interesting and may be explained by the notion in consumer psychology that 'occupied time feels shorter than unoccupied time'.²² That is, when doctors wait for something, they cannot proceed without the items they are waiting for and hence the time is 'unoccupied'. Glouberman and Mintzberg proposed a vertical divide between doctors (surgeons and anaesthetists) and non-doctors (managers and nurses).⁷ Nurses tend to form an insider coalition with the managers (against the doctors) and the doctors tend to form a status coalition with the trustees (i.e. boards or government). Among the doctor group, anaesthetists perceived more delays when waiting for resources and they gave a significantly lower priority than the other three groups to the variables that are directly influenced as command issues. This supports the findings that anaesthetists serve as an intermediate between the surgeons and managers,⁴ in that anaesthetists can diffuse the diverging opinions between managers and surgeons because they have the medical expertise to help determine clinical priority, and this subsequently assists the clinical triaging process.⁴ Surgeons can only proceed with operations once anaesthetists finish their work and therefore they experienced less delay because the waiting for patient factors would be absorbed by the anaesthetists.

Relative to their non-manager counterparts, managers tended to experience more delay, with the exception of resources. However, overall, there is no significant difference in terms of perceptions of logistical delay factors. When prioritising patients for unplanned surgery, managers awarded higher priority to variables that are directly influenced by clinicians compared with their non-manager counterparts. These variables include responding to the opinions of anaesthetists, nurses, surgeons and on-site surgical specialists, which are the 'cure' and 'care' communities.⁷ The higher priority indicated by managers also resonates with the finding that reinforcing priority setting would increase healthcare system efficiency.²³

It seems that managers choose to cross the horizontal divide when clinical need is indicated. The present study found that managers give higher priority to the variables that are directly influenced by the clinicians; this may indicate that the managers agree that clinical factors are paramount and clinicians are the most powerful stakeholders in the decision making process.

Mitchell *et al.* proposed a stakeholder theory and salience based on possessing one or more relationship attributes: power, legitimacy and urgency.²⁴ In the healthcare system, the decision making process regarding queue position for unplanned surgical cases certainly reflects these relationships. It can be observed that

the variables under individual sanction received the second highest priority, only after the capacity variables. Of the four occupation groups, the nurses indicated the least priority and the managers demanded the highest priority for this set of variables. Waldman and Cohn identified gaps between the doctors and managers in terms of medical and management attributes, such as the focus of work (one is on individual patients and the other is on organisational survival), decision making (one is independent and rapid, whereas the other is a group process and deliberate) and strategic approach (one is reactive, the other is anticipatory).¹⁸ These gaps clearly indicate the different views and approaches adopted by different groups in the healthcare system, and hence the conflicts that arise in practice.

Conclusions

Currently, the primary focus of the literature on scheduling of emergency surgery is on clinical decision making and the role of the surgeon in this decision making process. Professionals other than those who belong to the 'cure' paradigm may play a role in the decision making process.^{7,9} When there are waiting lists, there is a shortage of resources. This means that, in addition to clinical decisions being important, logistical factors should be taken into consideration.

In fact, logistical factors have attracted some attention from researchers on healthcare system performance. One example is the work undertaken by Dexter *et al.* on sequencing emergency cases in the US.¹⁶ Although clinical decisions were deemed a priority, Dexter *et al.* attempted to integrate the notion of logistical importance. One exemplar solution was to provide surgeons with open access to operating room time on the work day of choice.¹⁶ However, once clinical priority is determined, it still leaves questions as to how to make the scheduling functional (i.e. executable and efficient). A better understanding of the decision making process and acknowledgement of the fact that managing urgency goes beyond clinical decision making alone are important to allow for integrated decision making about queue position and more efficient management of unplanned surgical cases.

The present article focuses on the logistical factors that influence the decision making process in scheduling unplanned surgery and reports on research undertaken in Australia and The Netherlands to improve decision making in scheduling emergency surgeries by taking into consideration logistical or operational factors. It describes the perceptions of 337 operating theatre staff (169 in Australia and 168 in The Netherlands) about the influence of logistical or operational reasons that may affect the scheduling of unplanned surgical cases. Respondents were asked to rate the reasons for delays and cast their preference of priorities for different factors. The results indicate that different groups in the healthcare system experienced or perceived different levels of delays and the preference regarding the priorities of logistical factors varies. Although resources are a common factor for delays and received the highest priority, factors under direct individual sanctions were also highly rated. This may further explain the tensions in the healthcare system and demand for an integrative and systematic approach to involve all stakeholders in the system and streamline logistical support for better healthcare.

Admittedly, the technological landscape of the healthcare industry has shifted somewhat since the data were collected for

the present study. For example, the promotion and adoption of electronic health records (EHRs) has had some effect on organisational efficiencies. The EHR is not merely a replacement for existing paper-based record keeping; it also aims to improve the quality and lower the cost of health care provision. However, implementing and adopting EHRs to their full potential has proven difficult. Poissant *et al.* pointed out that in order to attract physicians and nurses to using EHRs, it has to be a tool that can transform work processes and support innovation in care delivery.²⁵ Indeed, the benefits of the EHR have not yet been demonstrated in practice. For example, DesRoches *et al.* reported that there was no relationship between the level of EHR adoption and risk-adjusted length of stay, risk-adjusted 30-day readmission rates and risk-adjusted total costs.²⁶ In addition, there is scant evidence regarding the rate of adoption of the EHR for managing surgical settings. Jha *et al.* reported that the rate of adoption of the EHR in acute care hospitals in the US was very low.²⁷ The exact reasons for the low EHR adoption rate by health professionals are puzzling. For primary care physicians and nurses, it has been reported that the barriers to adopting the EHR include disruption of clinical workflow and a negative effect on interactions between health providers and patients.²⁸ Despite these challenges, the adoption of the EHR is expected to be highly relevant to logistical decision making and process streamlining in surgical settings. How the EHR will affect human factors when making operational decisions about emergency surgical queues merits further investigation.

Competing interests

To our knowledge there are no conflicts of interest.

Acknowledgements

The authors acknowledge the work of Dr Martin Lum and Professor Koos Krabbendam in assisting to conduct this research and thank Pietie Roobol and Ann Dadich for their research assistance.

References

- 1 Western Canada Waiting List (WCWL) Project. From chaos to order: making sense of waiting lists in Canada. Edmonton: WCWL Project, University of Alberta; 2001.
- 2 Hadley R, Forster D. Doctors as managers: experiences in the front-line of the NHS. Harlow: Longman; 1993.
- 3 NSW Health Council. Report of the NSW Health Council. Sydney: NSW Health; 2000. www.health.nsw.gov.au/pubs/2000/pdf/Health_Council_Report.pdf [verified 13 May 2012].
- 4 Fitzgerald JA, Lum M, Dadich A. Scheduling unplanned surgery: a tool for improving dialogue about queue position on emergency theatre lists. *Aust Health Rev* 2006; 30: 219–31. doi:10.1071/AH060219
- 5 Mazzei WJ, Blasco T. What's the best way to manage urgent and emergent OR cases? *OR Manager* 2005; 21: 1–12.
- 6 Pham H. Decision making in operating theatres: the management of unplanned surgery. Masters Thesis, University of Twente, Enschede, The Netherlands; 2007.
- 7 Glouberman S, Mintzberg H. Managing the care of health and the cure of disease – Part I: differentiation. *Health Care Manage Rev* 2001; 26: 56–9. doi:10.1097/00004010-200101000-00006
- 8 Hoffer Gittel J. Coordinating mechanisms in care provider groups: Relational coordination as a mediator and input uncertainty as a moderator of performance effects. *Manage Sci* 2002; 48: 1408–26. doi:10.1287/mnsc.48.11.1408.268

- 9 Glouberman S, Mintzberg H. Managing the care of health and the cure of disease – Part II: integration. *Health Care Manage Rev* 2001; 26: 70–84. doi:10.1097/00004010-200101000-00007
- 10 Fitzgerald JA, Lum M, Kippist L. Operating theatre bottlenecks: how are decisions about emergency theatre schedules made. 5th International CINet Conf; Sydney, Australia; 2004.
- 11 Lum ME, Fitzgerald JA. Priority emergency cases: are anaesthetists intermediaries in inter-professional warfare within the operating theatre. Aust and NZ College of Anaesthetists Annual Scientific Meeting, 16–18 May 2006; Adelaide Convention Centre; 2006.
- 12 Fitzgerald JA, Dadich A, Lum M. Operating theatre gridlock: how are decisions made on emergency surgical cases. *Asia Pac J Health Manage* 2007; 2: 21–9.
- 13 Wong J, Khu KJ, Kaderali Z, Bernstein M. Delays in the operating room: signs of an imperfect system. *Can J Surg* 2010; 53: 189–95.
- 14 George D, Mallery P. SPSS for Windows step by step: a simple guide and reference. 4th edn. Boston: Allyn & Bacon; 2003.
- 15 Nunnally JC, Bernstein IH. Psychometric Theory. 3rd edn. New York: McGraw Hill; 1994.
- 16 Dexter F, Epstein RH, Traub RD, Xiao Y. Making management decisions on the day of surgery based on operating room efficiency and patient waiting times. *Anesthesiology* 2004; 101: 1444–53. doi:10.1097/00000542-200412000-00027
- 17 Wood KM, Matthews GE. Overcoming the physician group–hospital cultural gap. *Healthc Financ Manage* 1997; 51: 69–70.
- 18 Waldman JD, Cohn KH. Mending the gap between physicians and hospital executives. In: Cohn KH, Hough DE, editors. The business of healthcare. Westport: Praeger Publishers; 2007. pp. 27–57.
- 19 McDonald R, Waring J, Harrison S. Rules, safety and the narrativisation of identity: a hospital operating theatre case study. *Sociol Health Illn* 2006; 28: 178–202. doi:10.1111/j.1467-9566.2006.00487.x
- 20 Ebertowski S, Hillyer L, Inbar-Metrokin G, Noll D. Good policies are guide to add-on surgical cases. *OR Manager* 1999; 15: 29–32.
- 21 Hunter DJ. Doctors as managers: poachers turned gamekeepers? *Soc Sci Med* 1992; 35: 557–66. doi:10.1016/0277-9536(92)90349-U
- 22 Maister DH. The psychology of waiting lines. In: Czepiel JA, Solomon MR, Suprenant CF, editors. The service encounter. Lexington: Lexington Books; 1985. pp. 113–24.
- 23 Organization For Economic Cooperation and Development (OECD). Health care systems: getting more value for money. OECD Economics Department policy notes, no. 2. Paris: OECD; 2010.
- 24 Mitchell RK, Agle BR, Wood DJ. Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts. *Acad Manage Rev* 1997; 22: 853–86.
- 25 Poissant L, Pereira J, Tamblyn R, Kawasumi Y. The impact of electronic health records on time efficiency of physicians and nurses: a systematic review. *J Am Med Inform Assoc* 2005; 12: 505–16. doi:10.1197/jamia.M1700
- 26 DesRoches CM, Campbell EG, Vogeli C, Zheng J, Rao SR, Shields AE, Donelan K, Rosenbaum S, Bristol SJ, Jha AK. Electronic health records' limited successes suggest more targeted uses. *Health Aff* 2010; 29: 639–46. doi:10.1377/hlthaff.2009.1086
- 27 Jha AK, DesRoches CM, Campbell EG, Donelan K, Rao SR, Ferris TG, Shields A, Rosenbaum S, Blumenthal D. Use of electronic health records in U.S. hospitals. *N Engl J Med* 2009; 360: 1628–38. doi:10.1056/NEJMsa0900592
- 28 Cotea C. Electronic health record adoption: perceived barriers and facilitators. Technical report. Brisbane: Centre for Military and Veterans' Health, The University of Queensland; 2010.