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Readiness for transfer: a mixed-methods study on ICU transfers of care

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ABSTRACT

Objective Past studies on intensive care unit (ICU) patient transfers compare the efficacy of using standardised checklists against unstructured communications. Less studied are the experiences of clinicians in enacting bidirectional (send/receive) transfers. This study reports on the differences in protocols and data elements between receiving and sending transfers in the ICU, and the elements constituting readiness for transfer.

Methods Mixed-methods study of a 574-bed general hospital in Singapore with a 74-bed ICU for surgical and medical patients. Six focus group discussions (FGDs) with 34 clinicians comprising 15 residents and 19 nurses, followed by a structured questionnaire survey of 140 clinicians comprising 21 doctors and 119 nurses. FGD transcripts were analysed according to the standard qualitative research guidelines. Survey data were analysed using Student's t-test with Bonferroni corrections.

Results General ward (GW) clinicians are more likely to receive ICU patients with complete discharge summaries while ICU clinicians receiving GW patients get significantly less data. Emergency department (ED), GW and operating theatre physicians accompany their patients to the ICU while ICU nurses accompany their patients to the GW. Not all units, such as the ED, experience bidirectional transfers.

Conclusion The protocols and supporting data elements of an ICU transfer vary by the type of transfer and transferring unit. Readiness for transfer means that sending unit protocols affirmatively consider the needs of the receiving unit's data needs and resource constraints.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ It theorises intensive care unit (ICU) transfers as bi-directional processes.
⇒ Mixed methods comprising focus group discussions and a large sample survey.
⇒ Interprofessional participants from ICU, emergency department, general ward and operating theatre, reporting as senders and receivers of ICU patients.
⇒ Single site study.
⇒ Patient outcomes not measured.

INTRODUCTION

Intrahospital patient transfers involve the shifting of care responsibilities between hospital units as a patient's clinical status changes.[1] Although the patient remains in the same healthcare facility, changes in clinical teams are associated with varying degrees of familiarity with the initial presentation and subsequent course of illness. Transfers that are poorly managed, delayed or disrupted by differing monitoring protocols in different units put patients at risk of suboptimal continuity of care. Transfers of care for intensive care unit (ICU) patients need to be examined not only because of the dynamism, complexity and critical nature of their conditions at the time of the ICU admission but also to ensure that clinical units receiving discharged ICU patients are ready to support these patients.

Current studies on ICU patient transfers focus on the admission or discharge process. This leaves a knowledge gap of the other transferring clinical units' needs. The objective of this study is to close the gap by exploring the bidirectional transfer of care between the ICU and its partnering clinical units. It seeks to document the processes and types of data elements that different clinical units (general ward (GW), operating theatre (OT) and the emergency department (ED)) employ to discharge or admit ICU patients. Finally, the study aims to identify the dimensions associated with the readiness for transfer. The readiness for transfer is defined s clinicians' awareness of their counterparty's process and data requirements prior to enacting a transfer. Since transfers of care are ubiquitous in all hospital-based medicine, this study could help practitioners in other settings (such as hospital to home, hospital to long-term care facilities) with their own bidirectional transfers.

LITERATURE REVIEW

Systematic reviews on ICU transfers predominantly report a research focus on improving data exchange between sending and receiving clinicians using structured communications and standardised handover tools, such as communication checklists or electronic medical records templates.[2–8] However,

where the types of data elements are concerned, there is less agreement on the minimal data set for all ICU transfers as they are specific to patient conditions, risks and the clinical units involved in the transfer.[9]

The barriers to ideal ICU transfers are unclear expectations, confusion about receiving clinicians' informational needs and poor teamwork.[7 10] Critically, a systematic review of systematic reviews found little evidence on what constitutes 'best transfer practice'.[6] For example, in ED to ICU transfers, which is generally a unidirectional transfer, the literature reports a heterogeneity of structured patient transfer processes.[11–14] In OT to ICU transfer protocols, five phases were identified (pretransfer preparation, transfer and set-up, pre-report preparation, OT to ICU handoff report communication and post-report discussion) across 32 studies in a systematic review.[5] However, no study included all five phases of the protocol.[5] Consequently, avoidable technical errors, such as the absence of critical equipment for the ICU admission, were reported with standardised protocols.[15] One study on ICU to OT transfers noted improvements in communication and patient transport readiness with a standardised protocol but that study did not include surgeons.[16]

In GW to ICU transfers, the literature tends to focus on the patient risks for sudden declines rather than on the transfer protocol, per se.[17–19] For transfers in the other direction (ICU to GW), a systematic qualitative review reports the importance of handover tools, such as using liaison nurses and communicating family expectations, but not the transfer process.[20] Finally, the literature reports that while receiving ICU clinicians expect complete patient data from the sending units (ED, OT or GW), they do not usually receive it.[21]

The literature reports the importance of noting the patient's acuity and the type of transferring unit to ensure the continuity of care. For example, an ICU-discharge patient is more stable than an ICU inpatient but less stable than the average GW patient. As such, ICU clinicians can overestimate the readiness of GW clinicians to receive their patients.[22] Thus, specialist nursing care may be required for discharged ICU patients, but the average GW nurse may not have such experience.[23] More importantly, GW nurses have higher caseloads than ICU nurses, which precludes the type of close monitoring required for recently discharged ICU patients.[16 24–26]

In conclusion, the research on ICU transfers characterises them as heterogenous unidirectional processes. There is little agreement on the protocols, tools, data requirements and skills for effectuating safe ICU transfers between different clinical units. As such, we believe there is an opportunity to better understand ICU transfers as bidirectional processes, implying that both sending and receiving clinic units must be aware of the other party's data needs, constraints and responsibilities, which can vary with the patient's acuity.

METHODS

Study design

This mixed-method study uses focus group discussions (FGDs) and a structured questionnaire survey. FGDs, each lasting between 60 and 90 min, were conducted with residents and nurses of diverse races and ages from the ICU, GW and OT in November 2017. The ICU physicians were from the respiratory, cardiology and anesthesiology disciplines. We employed the critical incident technique to solicit participants' perceptions of their ICU transfer experiences (online supplemental appendix 1). The Domain Specific Review Board exempted the study from written informed consent. Verbal consent was obtained to audiotape the discussions for verbatim transcription. Participants were given the opportunity to leave the FGD at any time. Participants were given identification codes (P1, P2 and so on) and referred to each other using these codes so audiorecordings were anonymised. We did not record participants' identities, work performance or their patients' health data. The FGD facilitator took field notes to ask follow-up clarifying questions.

The findings from the FGDs were used to develop the large sample survey (online supplemental appendix 2) comprising six scenarios (online supplemental appendix 3), which were piloted and then implemented in February 2021. The scenarios serve to standardise the respondents' perceptions of patients' acuities and were developed by AM (respiratory intensivist) and verified by C-KT (anaesthesia intensivist) and CW (a nurse intensivist). ICU doctors and nurses were given three scenarios of acute patients from different units (ED, OT, GW) typically transferred into the ICU and asked to evaluate the current protocol and data elements they would receive from their counterparts (online supplemental appendix 3: scenarios 1 (ED), 2 (OT) and 3 (GW)). GW clinicians were given three typical scenarios of ICU patients transferred into GW of varying acuities and asked to evaluate their expected protocol and data elements from their ICU counterparts (online supplemental appendix 3: scenarios 4 (stable), 5 (medically complex) and 6 (socially complex)).

Setting

This study was conducted at a 574-bed general hospital in Singapore that admitted 36 678 inpatients from 107 448 ED visits (34.14%), of which 1536 (4.19%) were transferred directly to the ICU in 2017. There were 1552 ICU admissions from GW. The ICU consists of 74 critical care beds and admits all critically ill patients that include medical, surgical, neuro, cardiac or trauma cases. The ICU is staffed by 151 nurses and 17 residents while the GW is staffed by 761 nurses and 33 residents in addition to registrars and consultants. It does not have a hospitalist programme. The OT to ICU transfer is the only transfer with a formalised protocol. All other transfers are either facilitated by a discharge summary and/or verbal exchange of information. When the ICU patient's condition stabilises, the ICU doctor determines the time and

location for the discharge based on the patient's most active condition.

Participants

Focus group discussion

Purposive sampling for the FGDs focused on residents and nurses in the ICU, ED, OT and GW involved in transfers of ICU patients. All ICU and GW doctors and nurses were sent an email, followed by in-person requests by the director and senior nurse manager of the units. The final sample consists of clinicians who were willing and able to participate. Fifteen residents comprising six ICUs, five GW and four OT residents and 19 nurses comprising seven ICU, six GW and six OT nurses served as subject matter experts in six FGDs. ICU residents consisted of respiratory specialists, cardiologists and anesthesiologists. No prior relationships existed between the participants and the trained FGD facilitator. Each FGD comprised about six participants, which is the nominal size for reliable data collection. One GW resident and two OT residents received calls to attend to their patients prior to their scheduled FGD session and could not participate. No additional recruitment for participants was made after the sixth FGD when no new information could be gleaned about ICU transfers, that is, when theoretical saturation was reached.

Structured questionnaire survey

We emailed the population of 962 doctors and nurses in the ICU and GW to respond to the survey. Using the conventional choices of an alpha of 0.05 and a power of 0.80, a power calculation[27] yielded a minimum sample size of 100. We received 140 responses comprising 21 doctors (9 ICU and 12 GW) and 119 nurses (36 ICU and 83 GW) after two email requests. The final sample size was adequate for statistical power.

Patient and public involvement

None.

Data processing and analysis

To reduce bias, data processing of the FGDs was done independently by S-HL and PP, who did not conduct the FGDs. The transcripts were analysed according to guidelines for descriptive qualitative studies to determine themes and aggregate dimensions of the phenomenon.[28] The technique includes cross-referencing and comparing constructs discussed by the FGD participants.

We used line-by-line and incident-by-incident open coding followed by selective coding, focused coding and theoretical coding.[28] Using the informants' jargon, we identified and categorised initial concepts in the data with NVivo (QRS International) open coding. The first coder read each transcript to gain a literal understanding of the discussions.[28] Then, the data in the transcripts were separated into incidents through interpretative reading to reconstruct what was meant or represented.[29] The coder then examined the first order codes for similarities and differences to group similar incidents.[28] The second coder independently validated the initial incident groupings using the same process. The first coder then categorised the groupings of incidents and named the derived categories, based on their meanings. The second coder refined and reduced the number of categories to obtain the best parsimonious fit of the data.

Next, axial coding was used to identify higher-order themes from the first-order conceptual categories. Here, the first coder searched for relationships between and among the categories of first-order themes, which facilitated assembling them into higher-order themes.[28] The themes were derived inductively. The second coder independently verified these dimensions through a similar process. The coding processes were repeated iteratively, using different starting points in the transcript data until theoretical saturation was reached. Finally, overarching dimensions were extracted by grouping and regrouping similar themes until clear relationships between the constructs emerged.[30] Consensus was achieved between the two coders and among the research team in subsequent team discussions.

The questionnaire data were analysed using Student's t-test with Bonferroni correction to compare differences in perceptions between receivers in the ICU and GW as well as between doctors and nurses regarding their views of the transfer protocols and required data elements.

RESULTS

The mean age of 15 residents participating in the FGDs was 28.4 years (range: 24–40). Eight residents (53.3%) were men. Eight (53.3%) were Chinese and five (33.3%) were Asian Indian. Four (26.7%), eight (53.3%) and three (20%) had less than 1 year, 5 years and more than 5 years of clinical experience, respectively. The mean age of 19 nurses participating in the FGDs was 34.2 years (range: 25–43). Fourteen nurses (73.6%) were women. Ten (52.6%) were Chinese and four (21%) were Asian Indian. Seven (36.8%) had up to 5 years and 12 (63.2%) had more than 5 years of clinical experience.

Eighteen first-order concepts were derived from the FGD transcripts (table 1, with details in online supplemental table 1). Figure 1 summarises the concepts and themes. Seven second-order themes were derived from the 18 first-order concepts. Four third-order themes were derived from the seven second-order themes. The aggregate theme from the FGDs is 'readiness for transfer'. Results of the data analysis in figure 1 are reported in figure 2.

Table 1 reports a sample of the FGD data, which indicates that when ICU clinicians receive high acuity patients from lower acuity ED and GW units, they exhibit highly protocolised and data exchange readiness. Specifically, ICU doctors examine the ED patient before transfer, ICU nurses read transfer notes before transfer, and seek information to prepare for the patient transfer to the ICU.

The survey results are shown in table 2. With respect to the transfer protocol, GW clinicians report receiving

Table 1 Representative data supporting interpretations of ICU readiness for transfer

Physician prep	Process for transfer to the ICU
Non-ICU physicians prepare notes	► The operation note shows what was done, what the findings were, what we saw and post-op instructions on what needs to be done for the patient (in the ICU) and equipment used (03-P1)
Non-ICU physicians choose senders	► My (ICU doctor) greatest concern is when the sender (non-ICU doctor) is not the primary doctor because we need to make a special effort to call the primary doctor for more information, such as what transfusion was given or the fluid status (01-P5) ► The (ward) nurses or doctor who did the resus(itation) should accompany the patient to the ICU since they know the situation and will be able to give a comprehensive transfer (05-04) ► When we (ICU doctors) have a senior to do the transfer, such as anaesthesia or a senior anaesthetist from OT, a consultant or registrar, we get a very solid transfer (01-P6) ► ED nurses are not assigned to specific patients but all six staff are taking care of all the (ED) patients, each doing different task so it's difficult to have one nurse know everything about each patient (04-P3)
ICU physicians examine patient before transfer	► Give us (ICU doctor) time to go to ED to see the patient so that we know the case and are ready for the patient (01-P3) ► I like to assess the patient myself rather than rely on someone else; I may disagree with their understanding of the patient or it may be incomplete (01-P4)
Nurse prep	
Non-ICU nurses actualise patient	► We (ward nurse) have to request a transfer and get a bed in ICU before we can send the patient to the ICU (06-P4)
Non-ICU nurses choose senders	► When we transfer a ward patient to ICU, the nurse in charge of the patient will follow and transfer the patient to the ICU (05-P1)
ICU nurses read transfer notes	► If it's a patient with PCI (percutaneous coronary intervention), we need to read the chart and medication dosage (04-P3) ► We need to know if the OT patient is on morphine because it's a controlled drug and we need to go (to pharmacy) to get it (06-P2)
Non-ICU to ICU physician	Information given to ICU staff
Patient background	► What is the story behind the deterioration? What happened during that half an hour or 1 hour of the deterioration? How long has the patient been in the hospital? What were they originally in the hospital for? (01-P4)
Diagnoses	► Why is this patient coming to ICU? if there's an infusion, we want to know what the infusion was for (01-P4)
Investigations	► Tell us (ICU doctors) when the tube was in, what is the ventilator setting, are they on any vasopressors, what drugs have been given in the ED? (01-P2)
Care plan & follow-up	► Have the cath (catheter) lab (been) done up when the patient comes to us (ICU doctors)? (01-05)
Q&A	► Ask specific questions (or) you will not get the information you need (01-P3)
Non-ICU to ICU nurse	
Patient's state	► If ED is transferring an agitated patient or if the patient is under restraints, call so we can prepare the restraints or standby for more manpower (05-P2)
Medication & fluids	► Tell us basic things like medication, with what diluent, how much, what is the current dosage, what volume of fluid they (ED nurses) are running, how much they have given (04-P2)
Devices and equipment	► Tell us (ICU nurses) what equipment the patient needs, like oxygen cylinder, if intubated then monitors, so we can get all the things ready (04-P6)
Wound care	► Correctly document the number of wounds from OT (06-P3)
Care plan & follow-up tasks	► Tell us (ICU nurses) if the OT patient's drain or IDC (indwelling catheter) was clamped so that we can unclamp it after the transfer (06-P2) ► If we (ICU nurses) know a patient is sensitive to certain medication, we will monitor very closely to respond quickly (04-P1)
Q&A	► If I (ICU nurse) want some information from ED after the staff has left, even for very simple information such as oral medication, I have to call another number, which affects the whole treatment plan (04-P7)
Call ahead	► Call because we could be at lunch and are not there for the transfer of a critical case (01-P3)
ICU physician prep	Process for transfer from the ICU

Continued

Table 1 Continued

Patient notes	► Different people want to know different things, so documentation is most important; document clearly so others can follow your train of thought (01-P4) ► For ICU patients going to the ward, we (ICU doctors) pay attention to documentation to try to give the other side a more detailed picture (03-P4)
Discharge summary	► We (ICU doctors) synthesise the ICU stay (01-P3)
Choose senders	► Handing over of ICU patients should be from the primary team in ICU to primary team in general ward (02-P3) ► I (general ward doctor) prefer the ICU team to handover to me first even if the patient comes to the ward after hours so that I can look at the patient because the patient will be under my care the next day. I will handover this patient to my on-call team (01-P5) ► If the (OT ICU) patient is transferred back to our care (in OT), we know the patient…. so the transfer (sender) isn't an issue
ICU nurse prep	
Patient notes	► We (ICU nurses) document the current status and condition of the patient and focus on the latest changes (04-P2) ► Let ward nurses know what things to prepare to be able to handle (the incoming ICU patient) (05-P1) ► Prepare ICU discharge so ward nurses can easily find (information on) what the treatment is, what the post discharge treatment is, which doctor is in charge, how often the parameters need to be monitored, what we have to do (05-P3)
ICU info to gen ward	Information given by ICU staff
Patient background	► Why is the patient discharged from the ICU? (02-P1)
Diagnoses	► Just give me (ward doctor) the patient's information, like conditions, diagnosis, all those basic information (03-P3)
Medications	► Go over the flow sheets with the ward nurses (05-P1)
Investigations	► If there is any cannulation or lines, what time is it due? (05-P2)
Devices	► Tell us (ward nurses) if there are any special things we need to prepare such as what drip the (ICU) patient is on so we will prepare accordingly (05-P4) ► Patients from ICU have inotropes and stuff that (general ward staff) need a bit more time to go through to get ready (02-P1)
Care plan & follow-up	► What's the follow-up for the issue and the things that have been done? What needs to done that day and the next day? (02-P3)
Wound care (ICU nurses)	► What is the wound like, what is the wound size? (05-P5)
Family issues	► Tell us (ward doctors) if the patient has a huge group of family, if they are a bit difficult to handle, cannot take the diagnosis, things like that (02-P5)
Q&A	► For ICU cases, I (ward doctor) might need to probe a bit more to get more information on the ICU stay because not everything is in the discharge summary (02-P4)
ICU info to surgery	
Patient's state	► If the patient needs to go to OT, tell the anaesthetist why the patient is going down (deteriorating) (01-P3) ► Because we (OT doctors) operated on the patient, we know what the worries are and the things to pay attention to, so they won't be much of an issue to us because we know the patient from the beginning, so they (ICU doctors) tell us what they think is the diagnosis (03-P2)
Investigations	► Let OT know if the patient had been intubated in the ICU (01-P5) ► Because they (OT ICU patients) are our patients, we know them. Just let us know what has been progressing, whether there are new findings to note (03-P2) ► Is there any investigation or result that needs to be traced to decide if there is anything that needs to be done (03-P4)
Family issues	► Sometimes it may be an emergency op(eration) and the family were not told or have time to talk to the patient, we need to let the OT staff know (06-P1)
Q&A	► Some information may not be accurate, so it's our (OT doctors) responsibility to ask questions and clarify what has happened to the patient (03-P3)

Continued

Table 1 Continued

Call ahead	► Once I (OT doctor) received an ICU transfer when I was stuck in the operating theatre…let me know that it is a time-sensitive patient review and I can get somebody else to see the patient first (03-P3)
	Outcomes of transfer
Quality information	► Focus on relevant, important (patient) information that the receiver needs to know (03-P1) ► Complete the documentation before the transfer…it doesn't matter where the patient is coming in from as long as we (doctors) have information to rely on, we can manage the patient (01-P4) ► If the patient is sicker, we (doctors) will spend more time reading their history to understand and pay more attention (to those issues) (01-P3)
Care continuity	► Documentation ensures continuity of care…documentation is very important because if it is sketchy, people cannot follow the rationale for what we (doctors) do in the ICU and care becomes very disjointed…the doctor who is taking care of the patient has the responsibility to look through the notes to know what happened during the ICU stay (01-P4) ► ICU doesn't discharge patients after 5pm for transfer to the on-call (ward) team. We call the primary team before 4pm for them to look over the patient and they handover to the on-call team when a (ward) bed becomes available after they leave (01-P3)

ED, emergency department; ICU, intensive care unit; OT, operating theatre.

significantly more detailed discharge summaries when receiving ICU patients compared with ICU clinicians receiving patients from the GW. ICU nurses communicated with their GW counterparts more frequently prior to transfer and accompany the discharged ICU patient to the GW compared with GW patients admitted into the ICU. Finally, the ICU doctors report that ED, GW and OT doctors often accompanied high acuity patients to the ICU compared with when ICU patients at lower acuity are transferred to GW. Details of the differences for each scenario are plotted in line charts reported in online supplemental appendix figures 1 and 2.

Regarding the data elements received, GW clinicians report receiving more information on the patients' medical background, family and social issues, code status, level of agitation, reason for admission, results to follow-up, outstanding issues to monitor, procedures and investigators to perform, management plan for the patient and specialists to call for referrals, compared with what ICU clinicians report receiving from ED or GW for admitted patients. The data elements on fluids, equipment or devices used, medications and investigations done did not differ significantly between clinicians in ICU and GW at $p<0.05$. Finally, table 2 reports that the transfer protocol and data exchanges between doctors and nurses were not significantly different. Detailed differences among survey data for scenarios 4–6 are plotted in line charts in online supplemental appendix figures 3 and 4.

DISCUSSIONS

In this study, we use a combination of FGDs and a questionnaire survey data from clinicians. The results show that ED, GW and OT clinicians do not provide completed documents and discharge summaries to ICU clinicians as definitively as the latter for GW clinicians. The findings are comparable to past studies that in ED, GW, or OT to ICU transfers, ICU clinicians often do not obtain detailed patient data from sending clinicians.[12–14 21] The FGD data indicate that because ED nurses are assigned to tasks rather than patients, it may be difficult for an ED nurse to know a patient well enough to prepare a detailed summary for ICU transfer. Moreover, a patient's length of stay in ED may be too short to generate sufficient data for highly protocolised transfers. Due to shift changes, the ED and GW clinicians preparing patients for ICU transfers may not be the primary care provider and so the supporting data may not reflect the needs of the ICU doctor. In sum, the type of clinical unit and context of the transfer determine the type of data elements and additional actions needed to effectuate the transfer.

Variability in ICU transfer protocols may be explained by three factors revealed in the data. First, differences in the amounts and types of data elements exchanged may reflect the perceived roles of the ICU sender and receiver. For example, OT doctors do not provide discharge summaries when their patients are transferred to the ICU because they may not view this as a discharge of their responsibilities. As a result, surgeons provide anticipatory guidance to ICU clinicians, expecting to continue to 'own' their patients perioperatively. In the FGD, this is evidence by such comments as surgeons referring to patients as 'our patients' and 'if there is a bounce-back to OT, they do not need to ask ICU doctors too many questions because they already know these patients'. On the other hand, ED doctors do not provide comprehensive summaries or much guidance to ICU clinicians because patients belong to the admitting ICU clinician, and do not return to the ED. Hence, who 'owns' the patient plays a role in the amount and type of data conveyed to ICU receivers.

Second, we found a difference between ICU and GW transfers in their choice of personnel accompanying the

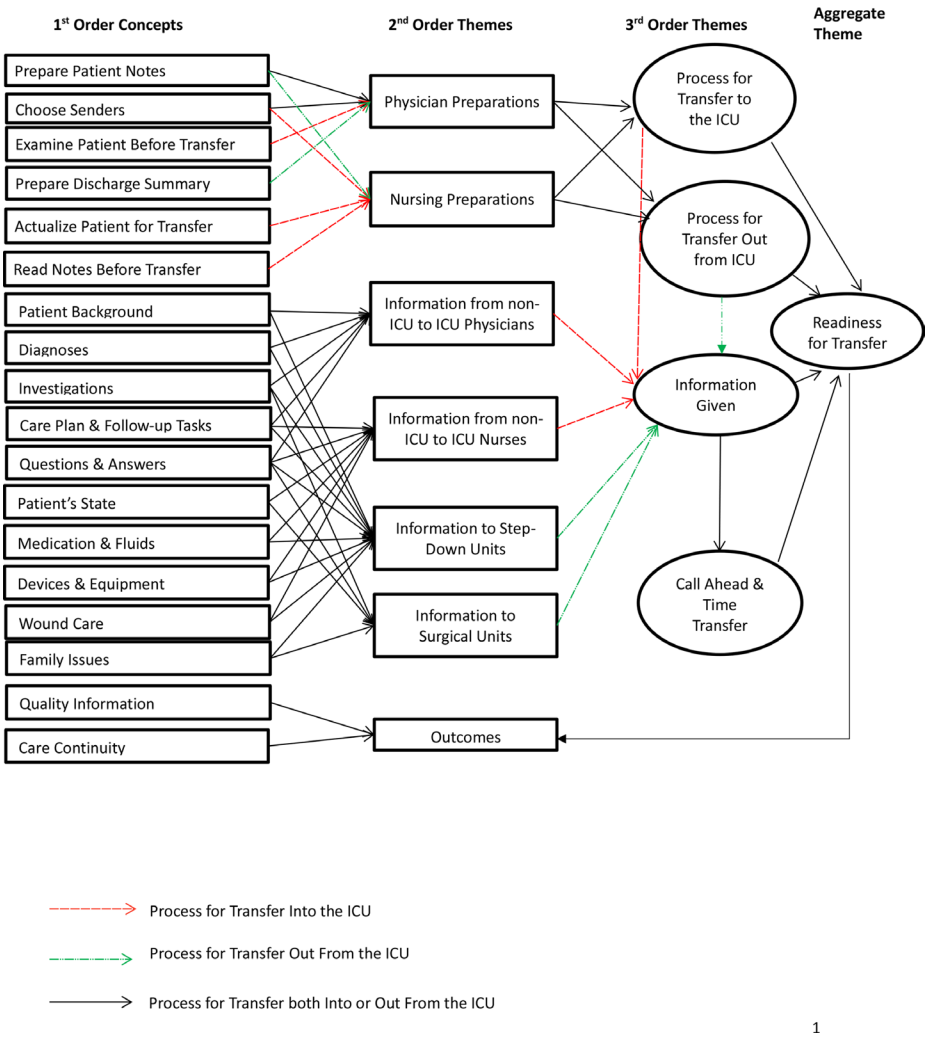

Figure 1 Second-order themes: (1) 'physician preparations': non-ICU sending physicians prepare patient notes and choose senders to transfer the patient, and ICU receiving physicians examine patients before admission to the ICU; (2) 'nursing preparations': non-ICU sending nurses actualise the patient, choose senders and ICU nurses read patient notes before receiving patients; (3) 'data from non-ICU to ICU physicians': non-ICU physicians give ICU physicians information about the patient's background, diagnoses, investigations, care plan and follow-up tasks, and provide opportunities to ask questions and receive answers; (4) 'data from non-ICU to ICU nurses': non-ICU nurses give ICU nurses information about the patient's state, medication and fluids, devices and equipment used, wound care, and provide opportunities to ask questions and receive answers; (5) 'data to step-down units': ICU physicians and nurses give their respective counterparts in the step-down units information about the patient's background, diagnoses, investigations, devices and equipment used, plans of care and follow-up tasks, wound care (provided by ICU nurses), family issues, and provide opportunities to ask questions and receive answers; (6) 'data to surgical units': both ICU physicians and nurses give their respective counterparts in surgery information about the patient's state, investigations performed in the ICU, and provide opportunities to ask questions and receive answers and (7) 'outcomes': quality of information and care continuity. Third order themes: (1) 'readiness for transfer into the ICU': non-ICU physicians and nurses choose appropriate senders who know the patient, non-ICU physicians prepare patient notes and non-ICU nurses actualise the patient so that ICU doctors can examine the patient and ICU nurses can read the notes before transfer; (2) 'data given': sending doctors and nurses provide patient information to their respective receiving counterparts and answer questions; (3) 'readiness for transfer out from the ICU': ICU doctors and nurses prepare patient notes, ICU doctors prepare discharge summary and the primary ICU doctor provides information to the receiving doctor in the step-down or OT units and (4) 'call ahead and time the transfer': occurs before the transfer to or from the ICU. ICU, intensive care unit; OT, operating theatre.

patient during a transfer. Given the higher patient acuity at the time of admission to the ICU, doctors from ED, OT and GW accompany their patients to the ICU to ensure continuity of care. Similarly, ICU nurses accompany the discharged ICU patients to GW because such patients are perceived to be more complex and at higher acuity than the average GW patient.

Third, differences in perceived knowledge and expertise of clinicians in the sending and receiving units affect the amount of data transferred. For example,

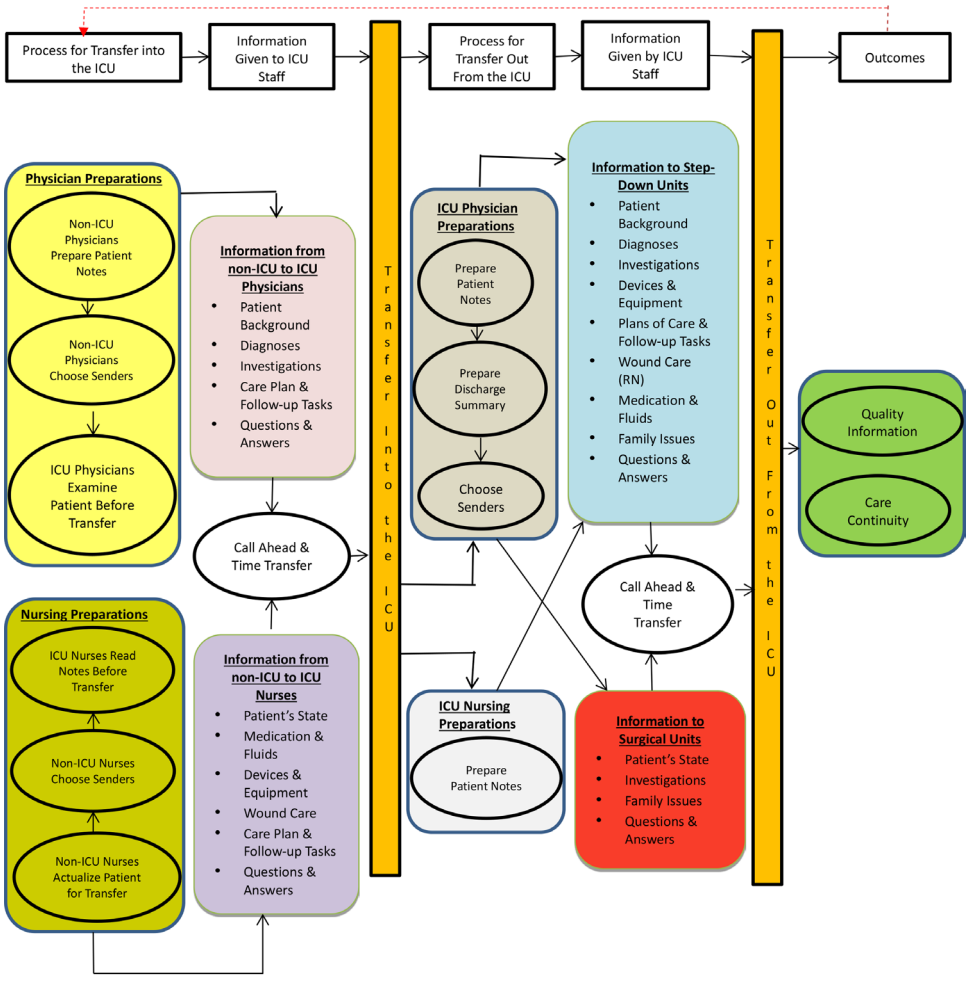

Figure 2 Readiness for transfer to the ICU depends on preparations made by the sending unit (GW, OT or ED) clinicians in the transfer protocol and data elements to be received by ICU clinicians. Readiness for transfer from the ICU depends on preparations made by ICU clinicians in the transfer protocol and data elements to be received by GW or OT clinicians. ED, emergency department; GW, general ward; ICU, intensive care unit; OT, operating theatre.

ICU clinicians do not provide background data on readmitted OT patients since they already 'belong' to the OT surgeons. This finding is supported by the fact that OT clinicians do not ask ICU clinicians for much patient data when their own patients are readmitted to surgery. Conversely, the data elements provided by ICU clinicians to GW are more comprehensive, as the expertise of clinicians in step-down units are perceived to be less specialised. Thus, the richness of data exchanged between units depends on the origin or destination of the patient.

A mixed-method design means that our triangulated data are likely more complete than single method studies. That said, the current study suffers from the same types of limitations one expects of exploratory studies in a single site. The findings may not be generalisable, although our literature review suggests that our findings are similar to studies in other contexts such as the USA. Another limitation is that our focus on the clinician experience and perception excluded attention to patient outcomes.

IMPLICATIONS AND FUTURE DIRECTIONS

It is interesting how similar were the concerns and experiences between the Singapore and USA contexts. The concept of who 'owns' the patient and is responsible for her care is similar. This seems to drive how discharges and admissions to ICU are handled. In the same vein, while acuity is an objective measure, the notion of *relative* acuity (eg, discharged ICU patient is more acute than average GW patient) is like the USA. The variability in transfer experience due to different skills, roles and expectations is like the USA. The use of discharge summaries is common across both contexts, but the ways in which these are used vary. Finally, a major lesson from this study is that standardised handoff protocols are unlikely to be equally effective across ICU handoff situations as the needs and expectations differ dramatically between clinical units. This has major implications for any facility looking to improve its handoffs and suggests that process designers first determine the needs and expectations of

Table 2 Differences in receiver perceptions of the transfer protocol and data elements

	ICU receivers, Mean (SD)	GW receivers, Mean (SD)	P value*	Cohen's d effect size†	Doctor receivers, Mean (SD)	Nurse receivers, Mean (SD)	P value*
Transfer protocol							
Documents & charts are completed by sender before transfer	3.42 (1.10)	4.21 (0.63)	<0.001	0.82	4.18 (0.68)	3.91 (0.92)	0.05
Discharge summary accompanies the patient during transfer	3.19 (1.17)	3.94 (1.04)	<0.001	1.08	4.00 (0.96)	3.67 (1.15)	0.13
A registrar or consultant examines patient before receiving the patient	3.82 (0.97)	3.56 (1.13)	0.14				
The primary resident from the sending unit accompanies the patient to the receiving unit	3.77 (0.98)	2.57 (1.23)	<0.001	1.15			
A nurse from the sending unit calls a nurse of the receiving unit before the transfer	3.96 (0.96)	4.28 (0.76)	<0.01	0.83			
A nurse from the sending unit transfers the patient to the receiving unit	3.56 (0.93)	3.90 (1.08)	0.04	1.05			
Data received about the patient							
Past medical background	3.49 (1.03)	4.25 (0.71)	<0.001	0.83	3.94 (0.77)	4.01 (0.92)	0.99
Family and social issues	3.29 (1.07)	3.95 (0.93)	<0.001	0.94	3.48 (1.10)	3.78 (1.00)	0.76
Code status	3.56 (1.08)	4.18 (0.79)	<0.001	0.89	4.05 (0.88)	3.97 (0.95)	0.99
Level of agitation	3.65 (1.01)	4.13 (0.81)	<0.001	0.88	3.69 (1.00)	4.02 (0.88)	0.25
Reason for ICU admission	3.74 (1.05)	4.20 (0.79)	<0.001	0.88	4.15 (0.88)	4.03 (0.91)	0.99
Fluids given in the sending unit	3.84 (0.91)	3.86 (0.96)	0.99		3.73 (1.20)	3.88 (0.89)	0.99
Equipment or devices used in the sending unit	3.60 (1.06)	3.88 (0.99)	0.15		3.85 (1.13)	3.77 (1.00)	0.99
Medication given in the sending unit	3.96 (0.79)	4.01 (0.87)	0.99		3.74 (1.16)	4.04 (0.77)	0.81
Investigations done in the sending unit & the results	3.61 (1.00)	3.91 (0.91)	0.06		3.76 (1.10)	3.82 (0.92)	0.99
Results to follow-up	3.46 (1.03)	3.89 (0.95)	<0.001	0.98	3.89 (1.04)	3.72 (0.99)	0.99
Outstanding issues for the receiver to monitor	3.44 (1.07)	3.95 (0.91)	<0.001	0.80	4.08 (0.86)	3.73 (1.01)	0.07
Procedures & investigations to be performed by the receiver	3.31 (1.12)	3.94 (0.93)	<0.001	0.99	3.66 (1.02)	3.75 (1.04)	0.99
Management plan for the receiver to consider	3.26 (1.00)	3.87 (0.88)	<0.001	0.92	3.66 (0.98)	3.69 (0.96)	0.99
Which specialist for the receiver to call for referrals	3.00 (1.08)	3.57 (1.12)	<0.001	1.11	3.37 (1.20)	3.37 (1.13)	0.99
Number of participants	45	95			21	119	

*P value adjusted by Bonferroni correction.
†Cohen's d effect sizes reported for variables with significant differences between groups.
GW, general ward; ICU, intensive care unit.

the providers prior to implementing trials of handoff tools and checklists.

In this study, we found several ways to improve ICU transfers based on the receiving unit's specific needs. For transfer from the ICU, the relative vulnerability of recently discharged ICU patients compared with average GW patients means that ICU clinicians should proactively push information to the GW to heighten the fidelity of data, and not simply rely on discharge summaries or checklists. Similarly, ICU clinicians should call ahead to the OT to verify that personnel, equipment and patient data are in place for receiving the patient. For admissions to the ICU, surgery patients should be accompanied by data on salient medical, socioeconomics, family concerns, follow-up tests and code status when leaving the OT. Such data would help ICU clinicians form a complete picture of OT patients' clinical and social conditions when making treatment decisions. In the case of ED transfers,

heavy caseloads in the ED may prevent the acquisition of complete information at transfer. However, one solution may be for the ICU clinician to receive the patient in the ED to gather data they need to make early diagnostics.

Second, we suggest that the use of unit-specific data checklists be based on patient acuity levels. For example, GW recipients of ICU patients who have less specialised skills may require specific instructions for the patient's care to reduce task ambiguity. The purpose of the checklist creates a shared mental model of the patient's current condition, diagnosis and prognosis and plan of care for the patient.[12 14] Aligning on the type of data elements to exchange at the time of transfer will reduce information variability, a common source of avoidable error.

Finally, we found that unit nurses paid more attention to their own doctors' orders than to those of other units. For example, a GW nurse commented that 'we had a patient with I/O (intake and output tube) and an NGT (nasogastric tube) and the primary team suggested that the NGT be removed, (but) we could not remove it because the ICU team had said to keep it until (the patient) reaches the ward'. We suggest a protocol for resolving conflicting instructions prior to transfer to include a formal step by the sending team to ask for and provide answers to questions from the receiving team.

The limitations we discussed earlier represent opportunities for future research. Although prior research has found that structured transfer processes were better than unstructured ones at reducing avoidable errors, the heterogeneity of transfers we documented means that patient outcomes may differ by type of transfer because avoidable errors may be qualitatively different. As well, because we were focused on the clinician experience in this study, we did not collect patient outcomes data. Future studies should include outcomes data such as errors, length of stay and unscheduled readmissions. In future studies, the effectiveness of the protocol should be quantified by such measures as process time, discharge complexity and time, and readmission to ICU. Finally, follow-up study should include data on clinician assessment and satisfaction with their readiness to transfer, and if these are related to avoidable errors.

CONCLUSIONS

The lesson from this research is that a standardised transfer protocol is unlikely to be effective when it does not account for the variability in transfer situations or when it ignores the fact that transfers are bidirectional processes (ie, sending and receiving is the same process but sending and receiving clinical units have different needs and expectations) with different requirements depending on the originating transfer unit and patient acuity. Thus, the readiness for transfer is not simply a preparatory step but implies that clinical units understand and act on the expectations and needs of their counterparts. In short, it's not only what an ICU clinician thinks matters to effectuate a transfer to the GW but what the ICU clinician knows about the needs of the GW clinician receiving the patient.

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