Fall 12-14-2021

Patient Placement Matters: A Systematic Review of the Impact of Multiple Patient Placement

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Disclosure: No grants or funding has been provided to fund the composition or execution of the body of work contributing to this manuscript.
Declaration of Interest Statement: I certify that I have NO affiliation with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

Abstract

Background

Inattention to the frequency of patient movement has been correlated with system-induced harm events, diminished favorable health outcomes, and reduction in patient and staff satisfaction. The incidence of adverse events increases significantly when multiple unnecessary lateral relocations result from secondary efforts to relieve hospital capacity constraints and improve efficiency.

Methods

A systematic review of literature was conducted to evaluate the impact of adverse events, patient and staff perceptions, and resource utilization on frequent patient placement events.

Results

Results of the analysis demonstrate that increased adverse events, negative patient and staff perceptions, increased workload, and resource utilization is significantly associated with intra-hospital transfer events.

Conclusion

The operational workflows designed to decrease throughput, address capacity constraints, and improve efficiency has a negative effect on the outcomes of patients within the acute care setting. Further research is indicated, with consideration of a composite metric, aimed at capturing potential adverse events and associated outcomes aligned with frequent clinically unnecessary bed movement along with interventions to reduce the occurrence of these events.

Introduction

In the advent of decreased hospital capacity and increased focus on hospital throughput, organizations have implemented multiple strategies to focus on bed placement. Increased quality improvement efforts and public reporting recognizes organizations for timely throughput in measurement from decision time to admission in the inpatient unit and yet lacks existing individual or composite measurements that reflect on the impact of the rapid placement of patients into patient care units and subsequent lateral movement (QualityNet, 2020). This emphasis on timely bed placement often results in patient placement into a unit that is atypical for the clinical diagnosis. Subsequently, the patient is referred to as a “boarder”, “outlier”, or “outlying patient”. These “outlier” patient’s receive care from nurses and physicians who may not have the same level of clinical expertise in caring for the clinical diagnosis of the patient resulting in decreased quality of care.

The evaluation of the impact of such movement on patients is that of an ethical obligation of organizations. As healthcare systems have grown in complexity, system-based latent conditional workflows that have impacted patient movement must be assessed. The development of these practices has a significant impact on the quality and cost of care along with added resource utilization, it must become a central focus within the healthcare industry. This systematic literature review compiles research evidence that further defines the impact of patient relocation, outlier location placement, and adverse event occurrence within the acute care adult patient population.

Background

Efforts to decrease the number of adverse events that occur within healthcare settings have been a focus since the publication of, "To Err is Human" (Kohn, 2000). In the same year, James Reason developed the model for human error and defined the concept of latent conditions (2000). Reason defines two factors in which adverse events occur, that of active failures, in which the individual performs an unsafe act, and that of a latent condition (Reason, 2000). Latent conditions consist of system-based, designed, or developed elements that are based upon organizational decisions resulting in a situation in which a patient could experience an adverse event. It is reasonable to believe that latent conditions have become increasingly difficult to recognize amidst system complexity. Goulding et al. explores this through, researching the effect of inappropriate unit patient placement and underlying patient safety events that arise secondary to hospital throughput strategies. (Goulding et al., 2012). Latent conditions related to hospital bed placement structure are further supported by a finding within a large medical center setting citing 65.8% of patient movement is based upon hospital efficiency needs rather than the clinical condition or patient needs (Webster et al., 2016). The systematic literature review aims at further defining the ways in which patient outcomes are affected by patient bed placement and movement within the acute care setting.

Methods

A systematic literature review was initiated to evaluate the presence of adverse outcomes associated with frequent lateral inpatient movement in the absence of clinical justification for the relocation. The literature review involved the use of the University of San Francisco Gleeson

Library with broad access to shared library resources. Key terms in the search include: “hospital adverse outcome”, “outlier”, “inpatient bed management”, “boarder”, “clinically inappropriate bed”, “length of stay”, “mortality”, “nursing workload”, “unit placement” and “patient safety”. The initial search encompassed a five-year period from 2015- 2020, with specifications including the selection of only peer-reviewed academic journals within the Medline, CINAHL, and Scopus databases with two primary disciplines of “health and medicine” and “nursing and allied health” included. Initial results of the search yielded 4,428 citations, duplicates were removed to yield 4,394 citations remaining. In total, 4,428 citations were hand searched and reviewed to determine relevant content based upon the title and abstract alignment with the adult inpatient population. Articles were first reviewed by title to determine relevance to the study, followed by a review of abstract, to include 34 articles in total, encompassing additional citations extrapolated from the reference lists of originating articles (See Table 1). Fourteen journals were excluded resulting in 20 articles selected for final review (See Table 2). Journal articles excluded were removed from the study due to the sole focus of boarding in the Emergency Department.

Selection criteria included research that provided qualitative and quantitative analysis regarding inappropriate placement or relocation of patients within the acute care hospital setting. Quantitative analysis articles were inclusive of retrospective and prospective studies that encompassed both a specific population of patients (i.e. “older”, “frail”, “dementia”) and large studies involving all populations within the research setting. Qualitative studies involved structure and semi-structured surveys of both patients experiencing inappropriate bed placement or relocation during an episode of care and that of staff within the research setting. Journal articles were evaluated and reviewed utilizing the John Hopkin research evidence appraisal tool (Dang et al., 2018).

Results

Thematic review was utilized to summarize findings. In total twenty articles were defined as eligible, consisting of a compilation of qualitative and quantitative studies. Summary content was bundled into three separate categories: impact on safety and quality of care, impact to resources within the hospital setting, and patient/staff perceptions.

Length of Stay, Cost, and Nursing Workload

The impact of nursing workload was identified in three of the studies encompassed in the literature review, conducted by Blay et al. (2014, 2017, & 2017). Blay conducted a two-phase study encompassing a) the volume of bed transfers within an acute tertiary medical center and b) an observational time study. The results of phase one noted 34,715 transfers of 10,000 patients within a one-year window, resulting in 2.4 transfers on average (Blay, Roche, Duffield & Gallagher, 2017). The second phase included 118 hours of review quantifying the time involved in three separate patient movement events: sending patients, receiving patients, and transferring patients to a different bed assignment (Blay, Roche, Duffield, & Xu, 2017). The results of this study found the average time to transfer a patient was 57.5 minutes with three specific intervals measured a) sending of a patient to another unit averaged 61.6 minutes, b) receiving a patient averaging 68.3 minutes, and c) intra-unit bed transfer averaging 29.2 minutes (Blay, Roche, Duffield, & Gallagher, 2017). Blay et al. also identify an operational accounting gap preventing accurate allocation of nursing hours (related to infra-hospital transfers and intra-unit bed relocations) as a defect when aligning staffing to patient care needs (Blay, Roche, Duffield, & Gallagher, 2017). Applying the estimated 2.4 transfers per patient, translated to 11.3 FTE's of

nursing hours monthly to specifically facilitate patient movement over the course of a one-year timeframe. (Blay, Roche, Duffield, & Gallagher, 2017).

Although the length of stay is primarily considered a quality and safety consideration of care, increased length of stay has an operational impact both on resources and cost for the episode of care. Kanak et al. notes a statistically significant association in both a) the number of units a patient is placed on and a subsequent increase in the length of stay; and b) the number of units the patient is placed on and an increased cost associated with care (Kanak et al., 2008). Later studies found similar findings stating that length of stay increased from 6 days to 18 days when patients were placed in "outlier" units (Ranasinghe et al., 2016). Consistent with this finding, research noted increased length of stay within studies of "outlier" placement of patients (Santamaria et al., 2014; Stylianou et al., 2017; Webster et al., 2016; Stowell et al., 2013). Two of these studies noted a doubling in length of stay when patients were transferred multiple times (Stylianou et al.2017; Webster et al., 2016). Conversely, three studies noted a decrease in length of stay for patients placed in "outlier" units (Paramal-Lewis et al., 2013; Paramal-Lewis et al., 2016; & Serafini et al., 2015).

Safety and Quality of Care

Adverse events were noted within the articles in two separate methodologies; 1) that of a composite prior defined grouping of adverse events considered relevant within the study or 2) in a single categorical indicator of the quality of care. Three articles presented overall composite adverse event evaluation associated with their research; while the remaining studies quantified individual measures of adverse events.

Composite measures of adverse events supported the impact of these increased adverse events to be statistically associated with multiple unit placement of patients. Odds ratios increased incrementally with increased patient relocation events, patients placed in 2 units demonstrated an increased odd ratio of 1.25, three to four units demonstrated an odds ratio of 2.14, and five or greater unit placements demonstrated an odds ratio of 4.03 (Kanak et al., 2008). Similarly, Webster et al. noted a three-fold increase in the likelihood of the patient experiencing an adverse event (inclusive of a fall, medication error, pressure ulcer, treatment delay, treatment error, or unnecessary radiological exposure) (2016). Weissman et al. associated adverse events with sustained hospital capacity at over 100% for extended periods of time demonstrating statistically significant adverse events rates (2007).

Individual measures that reflect the effects of patient movement include measuring discharge disposition of the patient, reflecting an up-transfer or need for a higher level of care, and/or failure to return to the prior residence at the time of discharge. Three studies reflected the association between patient movement and discharge disposition. Kanak et al. found the odds of the patient returning to home decreased as increased patient movement occurred during the episode of care (2008). Patients receiving care in two units had 80% odds of being discharged to home, with three to four units demonstrating 58% odds, and five or more units reflecting only 36% of patients returning to their prior home setting (Kanak et al., 2008). Paramal-Lewis et al. found 17.6% “outliers” required up-transfers to facilities to receive additional services such as palliative care or rehabilitation services not offered in the primary acute care setting (2016). The results of this study found the “outlier” group had a higher likelihood of referral for additional services (OR: 1.931, CI=1.1559-2.391, p=0.000) (Paramal-Lewis et al., 2016). Rangasinghe et al. combined the measure to include all mortality and up-transfers into one indicator of care

stating 38.8% of patients versus 9.1% within the control group experienced either an up-transfer or episode resulted in mortality (2016).

Mortality was noted in seven articles, six of seven indicated mortality rates were affected by patient relocation and/or inappropriate placement of patients (Paramal-Lewis et al., 2016; Paramal-Lewis et al., 2013; Ranagsinghe et al., 2016; Santamaria et al., 2014; Serafini et al., 2015; & Stylianou et al., 2017). Stylianou et al. reviewed 71,038 patients over a 3-year period, stating univariate analysis from a baseline of 5% to 9.74% when patients were placed as medical unit "outliers" (Stylianou et al., 2017). In another study of 23,312 patients noted an increased risk-adjusted mortality rate of over 40% when patients were placed as an "outlier", specifically 50% of all deaths associated with "outlier" status were noted within the first 48 hours of care (Paramal-Lewis et al., 2013). The same researcher conducted a focal study including 7,073 patients with dementia and delirium, noting again an increased risk of mortality within the first 48 hours when being placed as an "outlier" and an increased risk within 28 days of discharge representing 8.2% of the study population resulting in a mortality event (Paramal-Lewis et al., 2016).

Increased incidence of falls was researched within four specific studies, of which all four reported an association between increased patient movement and the occurrence of falls (Kanak et al., 2008; Blay, Roche, Duffield, & Xu, 2017; Ranasinghe et al., 2016; Toye et al., 2019). Falls nearly double (OR 1.7 $p = 0.001$) when patients are moved to three to four units and when moved to five units the increase more than doubled (OR 2.43, $p < 0.001$) (Kanak et al., 2008). Blay et al. noted an increase of 13% (OR 1.31) with each additional infra-unit bed placement of the patient and an increase of 9.5% with infra-hospital relocation (Blay, Roche, Duffield, &Xu, 2017). In a final study, 397 patients were studied with patient relocation events ranging between

one and eight bed moves (mean 2.0, SD 1.2) there was a statistically significant association with increased movement events and falls (OR 1.56, 95% CI 1.11-2.18) (Toye et al., 2019).

The acquisition of a hospital-acquired nosocomial infection was broadly noted in three specific articles included in the literature review. In one study, a 1.5 time increased risk was noted in patients placed in two units (OR=1.59, $p = 0.046$), a three-fold increased risk if placed in three to four units (OR=2.87, $p < 0.001$), and a 5.5 time increased risk if placed in five or more units (OR= 5.56 $p < 0.001$) (Kanak et al., 2008). Specific to wound infections, patients experiencing infra-unit transfers had an increased odds ratio of 25% when considering all patients and 26% specific to surgical patients (Blay, Roche, Gallagher, &Xu, 2017). When evaluating patient movement infra-hospital had an increased odds ratio of 28% for all patients and 25% for surgical patients only (Blay, Roche, Gallagher, & Xu, 2017). The final study failed to demonstrate statistical significance and was of low volume (Ranasinghe et al., 2016).

The impact of nursing interventions associated with care (patient teaching and discharge teaching) was examined in one study included in the systematic review, noting a statistically significant association between the increasing number of units the patient was transferred to and a subsequent decrease in nursing interventions (Kanak et al., 2008). Nursing instruction in general declined below the once per day mean use rate incrementally as the volume of transfers increased (Kanak et al., 2008). Discharge planning followed a subsequent similar decline in nursing intervention with increasing infra-hospital transfers (Kanak et al., 2008). The decrease was noted to have been impacted by fragmentation of care and communication gaps. (Kanak et al., 2008).

Adverse events involving medication events and readmissions were represented with conflicting outcomes. In Kanak's research, medication errors doubled with three to four infra-

hospital transfers (OR=1.99, p <0.001) and quadrupled with five or more infra-hospital transfers (OR=3.87, p < 0.001) (2008). Blay et al. found no association with both bed movement or infra-hospital transfers (Blay, Roche, Gallagher, & Xu, 2017). Likewise, readmissions were met with differing outcomes (Paramal-Lewis et al., 2012; Ranasinghe et al., 2016; Serafini et al., 2014; Stylianou et al., 2017). In three studies the focus was placed on 28-day readmission rates, finding no statistically significant association between readmission and patient movement (Paramal-Lewis et al., 2012; Ranasinghe et al., 2016; Stylianou et al., 2017). Two noted differences were found by two separate researchers, a) Serafini et al. in 2016, noting 90-day readmission rates were 26.1% versus 14.2% compared to the group of patients more frequently "outlier" versus the control group that was not "outlied" as frequently and, b) Stowell et al. in 2013, noting 28-day readmission rates were statistically significant p=0.008).

Staff Perception and Patient Perception of Care

Considerations specific to nursing perceptions and patient perceptions of care were noted in two specific qualitative studies conducted by two separate research studies (Goulding et al., 2013 & Toye et al., 2019). Goulding et al. found multiple common themes within the patients that were surveyed regarding their experiences with being placed as an "outlier". Patients reported a general perception of a lower quality of care and decreased sense of having their place in the "outlying" unit along with failures in communication and a general sense of space-related urgency issues resulting in relocation (Goulding et al, 2013). Additionally, patients presented concerns regarding the knowledge level of nursing staff which affected their perception of the level of safety (Goulding et al., 2013). Lastly, patients expressed a decline in resource availability during their stay (Goulding et al., 2013). Toye et al. interviewed staff to discuss specifically the impact of "outlying" patients as it relates to fall prevention (2019). Common

themes expressed by staff included: decreased resources to prevent falls, communication challenges with both, having the appropriate length of time available to complete a comprehensive hand-off, and the ability to communicate fall risks at the time of hand-off (Toye et al., 2019). Staff also reported several factors that influenced bed movement involving contending clinical needs of the patient and relocating secondary to inappropriate first choice in location of the bed placement. Toye also surveyed patients and found reported increased stress associated with bed and unit relocation coupled with poor communication (Toye et al., 2019).

Discussion

The coordination of care is critical to obtaining a high level of quality of care. The impact of deviation in the coordination of care can have significant impacts on the outcomes of the patients in acute care hospitals. Early studies by Kanak et al. define that patients are moved between units at alarming rates with only 31% of patients experiencing a single unit placement of the full episode of care (2 units = 35%; 3-4 units = 21%; and 5 or more units =13% of patient episodes) (Kanak et al., 2008). Literature review paints a picture of fragmented care, reduced coordination in nursing care, increased mortality, increased adverse events, and decreased positive perceptions of care from staff and patients alike.

Adverse events to patients are presented by a variety of research studies, consistently associating frequent patient movement with harm events. Specific patient populations at higher risk include older populations, who experience on average at least two patient movement events per episode of care with an associated 56% increased odds of falling with each subsequent move (Toye et al., 2019). Santamaria et al. found that older patients were more likely to be placed as an outlier (2014). Older patients with delirium and/or dementia were found to be placed in "outlier" beds 90% of the time and experienced an average wait in the Emergency Department of

3.9 hours (Paramal-Lewis et al., 2016). These same patients were less likely to have a timely discharge summary provided with 34% of discharge summaries incomplete compared to the "inlier" group at 21% (Perimal-Lewis et al., 2016). Patients with delirium, as noted by Goldberg et al. correlated the volume of room transfers to increased occurrence of delirium in patients greater than age 70 (OR; 9.69, 95% CI, $p<0.0001$ (2015). In general, patients in "outlier" status represented 87% of emergency calls while waiting for "inlier" bed placement and were statistically associated with an increased risk of cardiac arrest events (Santamaria et al., 2014).

Stylianou et al. stresses the importance of the "right bed at the right time" strategy to minimize this risk (2017). The impact on resources is felt when patients are not initially placed in the correct unit and/or bed location. Blay reports the impact of nursing workload on relocation to significantly impact up to a full hour of time spent completing sending, receiving, or bed placement associated with the work of the transfer (Blay, Roche, Duffield, & Gallagher, 2017). Nursing allocation of resources does not capture or allocate resources based upon these increased labor-intensive events and does not account for associated activities such as gathering equipment, supplies, coordination of the transfer, preparation of the room, hand-off, education to the patient/family, and communication to management/bed placement staff (Blay, Roche, Duffield, & Gallagher, 2017).

Patients, when placed in "outlier" units or were relocated infra-unit or infra-hospital experienced increased risks, secondary to meeting throughput and operational challenges of the organization (Webster et al., 2016). Serafini et al. discusses the impact of high occupancy rates on the acquisition of hospital-acquired adverse events, noting an increase in adverse events coupled with high occupancy and workload (2014). Webster et al. defined 65.8% of patient movement as secondary to operational needs and efficiency versus patient conditional needs

(Webster et al., 2016). This latent condition places patients at increased risk with patients noting increased stress with infra-unit and infra-hospital relocation (Toye et al., 2019).

Limitations

The ability to track and evaluate patient movement is pierced with complexity. While several studies exist that captured large volumes of patient encounters, the source of this data is largely retrospectively evaluated through administrative databases and therefore not available in a concurrent display. The lack of real-time evaluation of patient placement considerations may create artifacts within the research and is prohibitive to understanding the unique "in the moment" judgments and situational challenges of bed placement.

A limited volume of studies has been conducted on the topic with several areas in which evidence is conflicting. Further studies are indicated to understand the relationship between bed placement and patient relocation with respect specifically to medication errors and readmissions (both at 28 and 90-day intervals) to further define the impact of these adverse event categories.

Conclusion

Decreased inpatient capacity, coupled with administrative designed practices that focus only on efficiency, and inattention to the frequency of patient movement has been correlated with system-induced harm events and diminished favorable health outcomes. The incidence of adverse events increases significantly when multiple unnecessary lateral relocations result from secondary efforts to relieve hospital capacity constraints and improve efficiency. System induced unnecessary lateral movement of patients to accommodate capacity and efficiency constraints is a latent condition that predisposes patients to increased incidence of adverse events. Addressing this problem is complex and multifaceted, involving a multidisciplinary team approach to solve it.

Healthcare leaders and frontline staff require knowledge building to further grasp the depth of the increased level of prior unidentified risk associated with unnecessary lateral patient movement. Empowering leaders to build an organizational culture and support improvement efforts while allowing frontline staff to apply knowledge and innovate within system workflows both at the macro and microsystem levels creates stronger alignment in overcoming organizational challenges and improvements in quality. Further definition of a balancing composite measure to evaluate the impact of patient relocation events would lend a greater degree of focus and associated improvements in care.

In closing, the literature presented summarizes the need for an increased focus on the system level workflows that drive efficiency and facilitate capacity constraints within medical centers. Consideration for specific at-risk populations, as well as, for the staff who care for these patients is a primary concern. Interventions aimed at the recognition of patients at risk and mitigation of risk may also play a central role in decreasing harm related unintended events.

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Evidence Table

Appendix A- Evidence Table						
Purpose of Article or Review	Design/ Method	Sample/ Setting	Conceptual Framework	Findings	Conclusions	Critical Appraisal Tool and Rating
Blay,N., Duffield, C.M., & Gallagher, R. (2012). Patient transfers in Australia: Implications for nursing workload and patient outcomes. *Journal of Nursing Management*, *20*(3), 302-310. https://doi.org/10.1111/j.1365-2834.2011.01279x						
Patient throughput and patient flow have created a reactionary bed management process, in which patients are unnecessarily moved resulting in increased nursing workload and increased medication errors, hospital-acquired infections, and patient falls.	Manuscript	Australia	None noted.	Synthesis of multiple studies correlate increased placement of patients in multiple units with gaps in care, increased adverse events, increased lengths of stay and a lack of continuity of care.	Patient throughput interventions have grown in complexity to meet the rising challenges of inpatient hospital bed placement resulting in multiple unit placement and ultimately increased risk to patients.	II-B
Blay, N., Duffield, C.M., Gallagher, R., & Roche, M. (2014). A systematic review of time study to assess the impact of patient transfers on nurse workload. *International Journal of Nursing Practice*, *20*(6), 662-673.https://doi.org/10.1111/ijn.12290						

Appendix A- Evidence Table						
Purpose of Article or Review	Design/ Method	Sample/ Setting	Conceptual Framework	Findings	Conclusions	Critical Appraisal Tool and Rating
Study of nursing time related to patient movement.	Two phase study: retrospective review of data paired with prospective observational time study.	500 bed tertiary hospital in Australia.	Observational time study and paired retrospective review of data (to determine the highest volume units to apply the observational study in).	10,000 patients were moved 34, 715 times, equating to an average of 2.4 transfers per patient. 1700 hours per month were spent on activities involving transfers. Nurses spend 53.6 minutes in total time to send and receive a patient.	Based upon the patterns of transferring within the specific hospital a significant amount of nursing time is spent transferring patients. In this facility, 11.3 FTE's are needed monthly to perform these duties. This activity should be further assessed and considered when determining staffing needs for nurses.	I-A
Blay, N., Roche, M., Duffield, C., & Xu,X. (2017). Intrahospital transfers and adverse patient outcomes: An analysis of administrative health data. *Journal of Clinical Nursing, 26*, 4927-4935. https://doi.org/10.1111/jocn.13976						
Evaluation of effect of intrahospital transfers and adverse events.	Retrospective, cross-sectional design.	Large tertiary medical center in Australia, 14,333 medical records were assessed.	Utilizing data sets, the data paired hospital movement with three specific adverse events (falls with injury, wound infection, and medication error).	On average, patients experienced 2.5 ward transfers and 1.9 bed transfers per episode of care. Movement between bed placement increased the odds ratio by 13% (OR=1.31), wound infections by 25% (OR =1.264) and 26% for surgical infections (OR =0.277).	Intrahospital movement increases the risk of studied adverse events. Movement should be evaluated for necessity of care.	II-A
Blay, N., Roche, M.A., Duffield, C., & Gallagher, R. (2017). Intrahospital transfers and the impact on nursing workload. *Journal of Clinical Nursing, 26* (23-24), 4822-4829.https://doi.org/10.1111/jocn.13838						

Appendix A- Evidence Table						
Purpose of Article or Review	Design/ Method	Sample/ Setting	Conceptual Framework	Findings	Conclusions	Critical Appraisal Tool and Rating
Assessment of nursing workload in relationship to unit transfers.	Retrospective and observational-timing study.	Large tertiary medical center in Australia, 10,000 patients assessed.	Utilization of administrative data set to determine the volume of transfers per patient. Observational-time studies were conducted by two trained observers.	Patients experience 2.4 transfers per hospital stay. Patient transfers average 24 minutes with bed transfers taking 11 minutes of nursing time.	Based upon the study and volume of bed transfers, 11.3 full time equivalents of nursing workload monthly is required to meet the need of bed transfers alone.	II-A
Buttigieg, S.C., Abela, S., & Pace, A. (2018). Variables affecting hospital length of stay: A scoping review. *Journal of Health Organization and Management, 32*(3), 463-493. https://doi.org/10.1108/JHOM-10-2017-0275.						
Scoping review of what affects hospital length of stay.	Scoping review utilizing Donabedian's Theory.	Scoping review.	Review of available literature assessing various variables affecting length of stay.	A combination of factors effect length of stay including characteristics of health care systems, clinical caregiver, complications and patients' social and family systems.	Complexity surrounds the variables effecting length of stay, of which create challenges for health care systems to overcome.	II-A
Goldberg, A., Straus, S., Hamid, J., & Wong, C.L. (2015). Room transfers and the risk of delirium incidence amongst hospitalized elderly medical patients: A case control study. *BioMed Central Geriatrics, 15*(69), 1-9. https://doi.org/10.1186/s12877.015.0078.8						
Assessment of room transfers on risk of	Case-control study.	Hospital setting, 994 patients	Transfers of the elderly to multiple rooms	Out of 994 patients assessed, 126 developed delirium during the hospital stay (OR	There is an association that is statistically significant indicating the incidence of delirium is	II-B

Appendix A- Evidence Table						
Purpose of Article or Review	Design/ Method	Sample/ Setting	Conceptual Framework	Findings	Conclusions	Critical Appraisal Tool and Rating
delirium in elderly hospitalized population.		included in the study.	has been suspected to have an impact on increased delirium	9.69, 95% CI, P<0.0001).	increased with room transfers.	
Goulding, L., Adamson, J., Watt, I., & Wright, J. (2013). Lost in hospital: A qualitative interview study that explores the perceptions of NHS inpatients who spent time on clinically inappropriate hospital wards. *Health Expectations*, *18*, 982-994.https://doi.org/10.1111/hex.12071						
Evaluation of care provided to patients when placed on inappropriate hospital wards.	Qualitative, semi-structured interviews.	England, sample of 19 patients placed in inappropriate hospital wards.	Patients treated in at least one inappropriate ward were included (n=19). Of these patients, eighteen also received care on the appropriate ward.	Patients preference is to be placed in the appropriate ward. Patients observed communication gaps, knowledge gaps of the nurse and medical staff unavailability.	Patients recognize that safety events may occur secondary to being placed in outlier wards. Recommendations provided to further mitigate inappropriate placement on wards.	II-B
Goulding, L., Adamson, J., Watt, I., & Wright, J. (2012). Patient safety in patients who occupy beds on clinically inappropriate wards: A qualitative interview study with NHS staff. *British Medical Journal of Quality and Safety*, *21*, 218-224. https://doi.org/10/1136/bmjqs-2011-000280						
Assessment of perceptions of patient safety issues and associated	Qualitative purposive sample of 29 members.	1100 bed acute care community hospital.	None noted.	Qualitative data regarding the safety issues that encompassed the placement of patients on clinically inappropriate	Several themes emerged including: increased nursing workload, delayed medical reviews, declining communication, lack of knowledge in caring for patients place in inappropriate units including failure	II-B

Appendix A- Evidence Table						
Purpose of Article or Review	Design/ Method	Sample/ Setting	Conceptual Framework	Findings	Conclusions	Critical Appraisal Tool and Rating
factors that may contribute.				units.	to recognize unstable patients.	
Kanak, Mary F., Titler, M., Shever, L., Fei, Q, Dochterman, J., & Picone, D. (2008). The effects of hospitalization on multiple units. *In Applied Nursing Research, 21*(1), 15-22. https://doi.org/10.1016/j.apnr.2006.07.001						
Focused research on the correlation of multiple unit placement on average number of daily nursing treatments, clinical outcomes, and resource use.	Quantitative-continuous dependent variables utilized the general linear modeling analyses and for dichotomous dependent variables utilized the logistic regression.	Data repository was extracted from a large data repository from a midwestern academic medical center. Sample was 7,851 patients aged 60 or greater within a 772bed tertiary medical center.	Not disclosed	Statistically significant findings were positively correlated on all three investigative assumptions. Increased number of units the patient is placed on statistically results in decreased nursing interventions (discharge planning and education), increased occurrences of medication errors, adverse occurrence, falls, nosocomial infections, and discharge disposition. From a resource utilization perspective, the study noted increased cost and length of stay with increased unit placement.	At the time of the authoring of this research very little research had been conducted to evaluate the impact of multi-unit placement. Increased coordination of care and application of technology.	II-A
Lloyd, J.M., Elsayed, S., Majeed, A., Kadambande, S., Lewis, D., Mothukuri, R., & Kulkarni, R. (2005). The practice of out-lying patients is dangerous: A						

Appendix A- Evidence Table						
Purpose of Article or Review	Design/ Method	Sample/ Setting	Conceptual Framework	Findings	Conclusions	Critical Appraisal Tool and Rating
multicenter comparison study of nursing care provided for trauma patients. *Injury*, *36*(6), 710-713.https://doi.org 10.1016/j.injury.2004.11.006						
Multi-centre comparative questionnaire to assess nursing care provided to acute trauma patients placed in trauma wards and outlier wards	Questionnaire	Three South Wales hospitals, 100 trauma nurses and 120 non-trauma nurses.	Not disclosed	Response rate was 100%, noted. Trauma nurses reported appropriate interventions and recognition of complications at a higher percentage than did the non-trauma nurses.	Patients placed in outlier status and provided care by non-trauma nurses may not receive the same level of care as patients placed in trauma units with care provided by a trauma nurse.	II-B
Perimal-Lewis, L., Li, J.Y., Hakendorf, P.H., Ben-Tovim, D.I., Qin, S., & Thompson, C.H. (2013). Relationship between in-hospital location and outcomes of care in patients of a large general medical service. *Internal Medicine Journal*, *43*(6), 712-716.https://doi.org/10.1111/img.12066						
Evaluation of the impact of outlier bed placement on patient outcomes.	Retrospective, qualitative	Database extraction, Flinders, Medical Centre consisting of 2492 records reviewed as outliers.	Hospital inpatient medical stays to general medicine were included in the study.	Outliers were associated with a higher in-hospital mortality (relative risk 1.41, 95% confidence interval, CI 1.16-1.73, p= 0.001).	Location of care provided has a significant impact on increase in-hospital mortality rates.	II-A
Perimal-Lewis. L., Bradley, C.E., Hakendorf, P.H., Whitehead, C.H., Heuzenroeder, L.M., & Crotty, M. (2016). The relationship between in-hospital location and outcomes of care in patients diagnosed with dementia and/or delirium diagnoses: Analysis of patient journey. *BioMed CentralGeriatrics*, *16* (190), 1-12.						

Appendix A- Evidence Table						
Purpose of Article or Review	Design/ Method	Sample/ Setting	Conceptual Framework	Findings	Conclusions	Critical Appraisal Tool and Rating
https://doi.org/10.1186/s12877-016-0372-5						
Assessment of impact on outcomes related to bed placement, inliers versus outliers.	Retrospective, descriptive study.	500 bed public teaching hospital in Australia.	Review of ICD-10 codes over a 7-year period of time including 7070 records.	Patients with dementia/delirium represented 1.9% of total population with 90% of patients classified as outlier patients. In-hospital mortality was statistically significant (48 hours after admission) (OR: 1.973, 95% CI: 1.158-3.359, p=01012) compared to inliers.	Patients with delirium/dementia have a higher incidence of admission to outlier units with higher odds ratio of death within the first 48 hours following admission. Further research should be conducted to determine if relocation to the inlier ward prior to 48 hours would reduce the incidence of mortality.	II-A
Ranasinghe, C., Fleury, A., Peel, N.M., & Hubbard, R.E. (2016). Frailty and adverse outcomes: Impact of multiple bed moves for older patients. *International Psychogeriatrics, 29*(2), 345-349. https://doi.org/10.1017/S1041610216001605						
Increased burden on hospitals to assign patients to licensed care space results in adverse outcomes to medically complex, frail older persons, who are at a heightened risk.	Quantitative-retrospective analysis, random sample pulled from 4, 334 admission.	Random paired sample of geriatric patients matched by sex and age (>65) compared to general medicine. Total population assessed of	Patients enrolled in the Older Person Evaluation Review and Assessment (OPERA) who lacked a defined ward were compared to general medicine	Comparatively, both sample groups had a mean age of 85.6 years (S.D. 6.1) and 64.3% were female. Median length of stay for OPERA patients was 7 days (IQR 4-13) and general medicine patients was 3 days (IQR 2-5) with a p<0.001). 22.% of patients enrolled in OPERA moved more than three times versus general medical 8% (p =0.03).	Study demonstrated the increased boarding of medically frail elderly patients (meeting criteria for the OPERA program) were at an increased risk of adverse outcome and increased risk of death/higher level of care discharges.	II-B

Appendix A- Evidence Table						
Purpose of Article or Review	Design/ Method	Sample/ Setting	Conceptual Framework	Findings	Conclusions	Critical Appraisal Tool and Rating
		4,334 of which 600 (divided evenly between the two categories of patient were included in the study.	population sample.	Incidence of adverse outcomes was noted at 59.7% (OPERA) versus 31.8% (general medicine).		
Santamaria, J.D., Tobin, A.E., Smith, R.J., Reid, D.A., & Anstey, M.H. (2014). Do outlier inpatients experience more emergency calls in hospital? An observational cohort study. *Medical Journal of Australia, 200*(1), 45-48. https://doi.org/10.5694/mja12.11680						
Assess the impact of being assigned as an outlier within a tertiary medical center and to evaluate the volume of emergency calls relating to outlying of patients in inappropriate patient care units.	Observational cohort study at a tertiary medical center over a five-month period.	Admissions summing 58,158 in a tertiary medical center.	Retrospective review of hospital coded conditions, either noted as primary or complication with associated logged patient movement paired with emergency calls.	18.97% (n= 11,034) of patients spent time as an outlier with a trend noted that older persons tended to be more frequently placed as an outlier. Conversely, same day admissions tended to not be placed as an outlier. Emergency calls were summed for outlier patients 3.8% [95% XI, 3.5-4.2%] versus 1.5% [95% CI, 1.4-1.6%]. Outlier patient calls consisted of 87% while their care was in an	Following adjustment for high risk, there is a 53% increased risk of an emergent call/need. Overall, outlier patients demonstrated an increase frequency of emergency calls, increased mortality, and increased complications.	II-A

Appendix A- Evidence Table						
Purpose of Article or Review	Design/ Method	Sample/ Setting	Conceptual Framework	Findings	Conclusions	Critical Appraisal Tool and Rating
				outlying unit, primary reason was cardiac arrest.		
Serafini, F., Fantin, G., Brugiolo, R., Lamanna, O., Aprile, A., & Presooto, F. (2015). Outlier admissions of medical patients: prognostic implications of outlying patients. The experience of the Hospital of Mestre. *Italian Journal of Medicine, 9* (528), 299-302.https://doi.org/10.4081/itjm.2015.528						
Review of the outlying phenomenon within the medicine and geriatric units to assess risk of mortality, readmission, and length of stay.	Multivariate analysis.	A total of 3828 consecutive patients hospitalized in medicine and geriatrics.	Consecutive patient stays were reviewed. Patient's received care from the physician specialty service of medicine and geriatrics; however, nursing care was that of the inappropriate unit placement.	Geriatric patients demonstrated twice the risk associated with being assigned inappropriately to a non-geriatric patient care unit. Both geriatric and medicine outlier patients experienced a statistically significant increase. Mortality risk doubled for patients placed as an outlier specifically when they are a surgical case.	Geriatric patients have an increased risk of becoming an outlier within the hospital setting. There is a direct correlation of risk both from a mortality and readmission perspective that suggest occupancy and bedding of patients should be a focus in healthcare.	II-B
Stowell, A., Claret, P.-G., Sebbane, M., Bobbia, X., Boyard, C., Grandpierre, R.G., Moreau, A., & de la Coussaye, J.-E. (2013). Hospital out-lying through lack of beds and its impact on care and patient outcome. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine, 21*(17), 1-7. https://doi.org/10.1186/1757-7241-21-17						
Comparison of quality of care when patients	Monocentric prospective matched-pair	French University Hospital, 552	Quality of care is effected by placing patients	Outlying patients had a one day increased length of stay (P=004), increased re-	Outlying status negatively impacts patients resulting in increased length of stay and readmission and	II-B

Appendix A- Evidence Table						
Purpose of Article or Review	Design/ Method	Sample/ Setting	Conceptual Framework	Findings	Conclusions	Critical Appraisal Tool and Rating
are placed in outlying or inappropriate wards.	cluster study.	in total with 483 underwent pairing within the study.	in another ward while waiting bed placement in the clinically appropriate unit.	admission at 28 days (P=0.008), and were less likely to be prophylactically treated for thromboembolic events at 42% vs 52% for the non-outlying group (P=0.03)	decreased prophylactic treatment of thromboembolic events.	
Stylianou, N., Fackrell, R., & Vasilakis, C. (2017). Are medical outliers associated with worse patient outcomes? A retrospective study within a regional NHS hospital using routine data. *British Medical Journal Open, 7,* 1-8. https://doi.org/10.1136/bmjopen.2016.015676						
Evaluate the impact of medical outlier status on quality and patient outcomes.	Retrospective, cross-sectional observational study design.	Hospital in England 565 beds, three years of retrospective data evaluating 71,038 cases.	Not disclosed.	Outlying patients demonstrate increased odds of readmission, no difference in mortality, and a double the odds increased length of stay.	Mortality was not significantly affected; increased length of stay was noted for patients placed in an outlier location.	II-A
Toye, C., Slayter, S., Kitchen, S., Ingram, K., Bronson, M., Edwards, D., van Schalkwyk, W., Pienaar, C., Wharton, P., Bharat, C., & Hill, K.D. (2019). Bed moves, ward environment, staff perspectives and falls for older people with high falls risk in an acute hospital: A mixed methods study. *Clinical Interventions Aging, 14,* 2223-2237. https://doi.org/10.2147/CIA.S211424						
Evaluation of the impact of bed movement on patient falls with associated staff qualitative	Mixed methods cohort study – Quantitative evaluation of the effect on	ED admissions, total population 486 (397 included in	Not disclosed	Of the 397 patients included in the study 27 patients fell during their admission, aged 70-102 (mean age 84.8 years, SD7.2), 57.4% female with a median length of stay	On average, inpatients experienced on average 2 bed moves during their admission, each bed move equating to an increased odd of falling by 56%. Factors impacting the gap include poor quality of	II-B

Appendix A- Evidence Table						
Purpose of Article or Review	Design/ Method	Sample/ Setting	Conceptual Framework	Findings	Conclusions	Critical Appraisal Tool and Rating
analysis on factors contributing.	bed moves on falls and Qualitative explorative study.	the study).		of 5.0 days. Patients ranged 1-8 bed moves during admission (mean 2.0, SD 1.2). Qualitative sample included 105 responses. Three themes emerged including: resources to prevent falls, about fall risks, and factors influencing bed movement.	communication at time of transfer, and time pressures placed on staff to move the patient.	
Webster, J., New, K., Fenn, M., Batch, M., Eastgate, A., Webber, S., & Nesbit, A. (2016). Effects of frequent patient moves on patient outcomes in a large tertiary hospital (the PATH study): A prospective cohort study. *Australian Health Review, 40*(3), 324-329. https://doi.org/10.1071/AH15095						
Study focused on the incidence of patient bed movement and patient outcomes related to such movement.	Quantitative – communications prospective cohort study design.	General tertiary, metropolitan, teaching hospital (900 beds and 90,000 admissions annually).		1529 patients screened (566 eligible for study), 54.4% male with mean age of cohort 58.1 +/- 17.0 years. 27.6% (n=156) of patients were moved once, 8.1% (n=46) were moved twice and 4.9% (n=28) were moved three or more times. Adverse events were three times more likely to occur in the population moved three or more times. Length of stay was increased to two as long for patients moved more than three times.	Patients moved three or more times are at increased risk of adverse outcomes and increased length of stay.	II-A

Appendix A- Evidence Table						
Purpose of Article or Review	Design/ Method	Sample/ Setting	Conceptual Framework	Findings	Conclusions	Critical Appraisal Tool and Rating
Weissman, J.S., Rothschild, J.M., Bendavid, E., Sprivulis P., Cook, E.F., Evans, S., Kaganova, Y., Bender, M., David-Kasdan, J., Haug, P., Lloyd, J., Selbovitz, L.G., Murff, H., & Bates, D.W. (2007). Hospital Workload and Adverse Events. *Medical Care*, *45*(5), 448. https://doi.org/10/1097/01.mlr.0000257231.86368.09						
Researched the relationship between workload and adverse event rate.	Retrospective, qualitative.	Four U.S. hospitals, sample size 6841.	Daily volume, throughput, intensity and nurse patient ratios comprised the workload measures with presence of adverse events outcomes.	Of the four hospitals, one facility had greater than 100% occupancy rates with statistically significance noted for both workload and adverse event outcomes of patients.	An increase in 0.1% nurse to patient ratio showed relationship of a 28% increase in adverse events.	II-A

Table 1 Flow Diagram

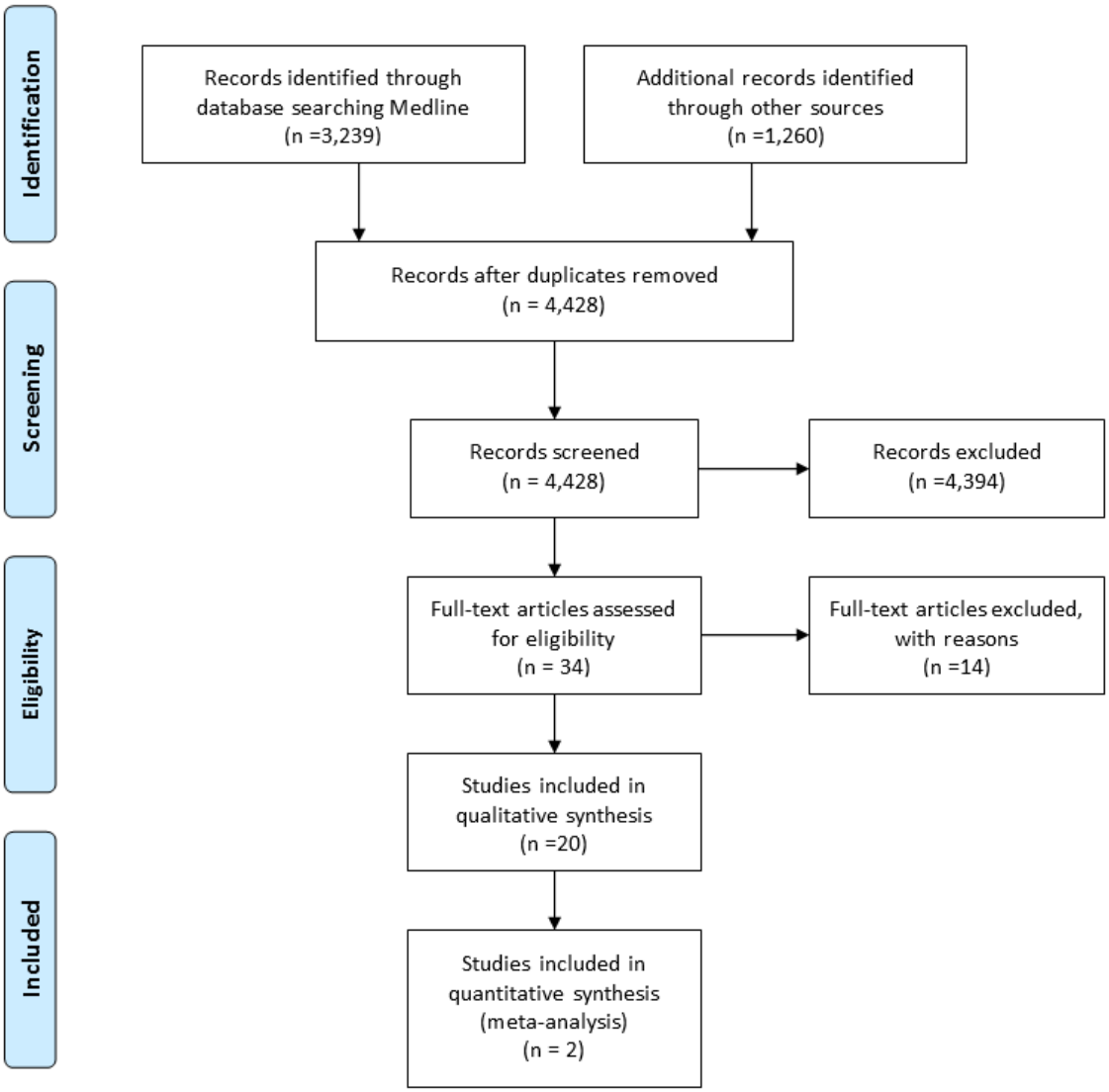

Table 2 Study Eligibility Criteria

	Inclusionary criteria	Exclusionary criteria
Publication Criteria	Published 2015-2021 English language Limited to "Nursing and Allied Health" and "Health and Medicine" subjects Published in Medline, Scopus, CINAHL databases	Published prior to 2015* All other languages aside from English
Types of Studies	All studies qualitative and quantitative with inpatient hospital focus	Publications specifically addressing populations less than 18 years of age, and maternal care population
Study Design	All study designs meeting inclusionary exclusionary requirements	None noted
Patient Transfers	All research reflecting research specific to outliers in the inpatient setting	Studies exclusively focused on hospital to hospital transfers

* Hand selected extrapolated referenced citations from 2000-2020.

Table 3
Definitions for Terminology

Term	Definition
"Infra-hospital transfers" "Intra-unit transfers"	The transfer of a patient to another unit within the same hospital/medical center.
"Boarder" "Outlier" "Out-lying	A patient receiving care in a unit that does not typically provide services pairing to the diagnosed clinical condition(s).
"Inappropriate Lateral Transfer"	The relocation of a patient to another unit without clinical indication indicated the need for such relocation.
"Up Transfer"	The transfer of a patent to a higher level of care based upon clinical presentation, may be within the medical center or external to another facility.
"Bed Transfer"	Transfer of a patient from one assigned bed location to another.