

MEDICAL FLIGHT HANDOFF:
A QUALITY IMPROVEMENT PROJECT

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ABSTRACT

Background: Flight medicine, transporting patients from small facilities over long distances, is essential in rural areas. Providing pertinent patient information to receiving care teams is critical and evidence suggests that over half of the pertinent patient information is omitted.

Problem: Incomplete patient information provided by the flight medicine community can negatively impact patient safety and receiving team care.

Methods: This QI project intended to increase efficiency of patient handoff to receiving care teams by way of a “drop sheet”. The drop sheet was developed using the Mechanism Injuries Signs/Symptoms Treatment (MIST) mnemonic. One carbon copy of the drop sheet was left with the receiving nurse; the flight crew retained the other. A QR code was printed at the bottom of the drop sheet linked to a Likert-type survey assessing the comfort, completeness, timeliness, and effectiveness of the flight crew’s patient handoff.

Interventions: Training on the drop sheet and survey coincided with the project roll-out January 10th, 2023. Flight crews were instructed to complete a drop sheet on every patient and to leave a copy of the drop sheet with staff on the receiving team.

Results: At the projects conclusion, (03/10/2023), 64 flights were completed; drop sheets were used 67% of the time. Four surveys were completed during the data collection time.

Conclusions: According to the literature, consistent information provided by flight crew handoffs can improve patient safety and report completeness to the receiving care team. Drop sheets were successfully utilized though receiving care team satisfaction with the process remains inconclusive.

CHAPTER ONE

INTRODUCTION AND REVIEW OF THE LITERATURE

Background

In the flight medicine environment, there are diverse styles of communicating patient handoff (Cohen & Hilligoss, 2010; Reimer et al., 2018), suggesting continuity of care rests with the flight crews transporting to the receiving facility. These facilities frequently receive pre-transport patient reports from the sending facility or field unit; however, the patient and the flight crew can experience an evolving urgent situation once in the air. Once the patient arrives at the receiving facility, the bedside receiving nurse is sometimes left out of the flight report as other urgent tasks take priority. Flight crews can omit up to half of pertinent patient information given to the receiving staff (Goldberg et al., 2017; Harmsen et al., 2017. In one study, critical flight patient vital signs were missing in the handoff 86% of the time (Maris et al., 2022).

Inadequate handoff could be related to limited diagnostic capabilities of flight medicine or distraction by the patient's ongoing needs (Goldberg et al., 2017; Veldstra et al., 2015; Maris et al., 2022). In addition, flight crews endure stressors unique to the changing light, temperature, vibration, altitude, and maneuvering while managing a patient. Therefore, despite ground services being the preferred method for patient transport, flight transport is favorable if the transport distance is greater than 60 miles or geographic features are a consideration (Lyng et al., 2021).

Prehospital and patient transports are a diverse population, typically inclusive of the "sickest of the sick." While flying, handoff in the setting of flight medicine often exacerbates

critical patient parameters due to the urgency of transports. Choosing to fly is often relative to an average speed three times that of ground transport, and the stressors of flight impose unnatural demands on the patient's physiology. However, these factors also affect the flight crew, causing fatigue, hunger, thirst, irritation, and abruptness during handoff (Makkink et al., 2022).

Many handoff tools have arrived on the scene to address this issue. Unfortunately, the consistency of using handoff tools in real-life scenarios is limited, particularly in flight medicine (Wilson et al., 2017). Inadequate handoff can negatively affect patient safety, and features of the prehospital-emergency environment add to this complexity (Makkink et al., 2022; Maris et al., 2022; Muller et al., 2018; Turkelson et al., 2020). Inadequacy may be partly related to the diversity of the flight medicine industry, which ranges from physician-staffed helicopters to ubiquitous nurse-paramedic domestic air ambulances, to long-range fixed-wing aircraft stationed overseas.

Objective

This review aims to explore the literature in search of solutions to increase consistency and adequacy in flight crew handoff in order to propose interventions shown to increase patient safety, care continuity, and nurse comfort.

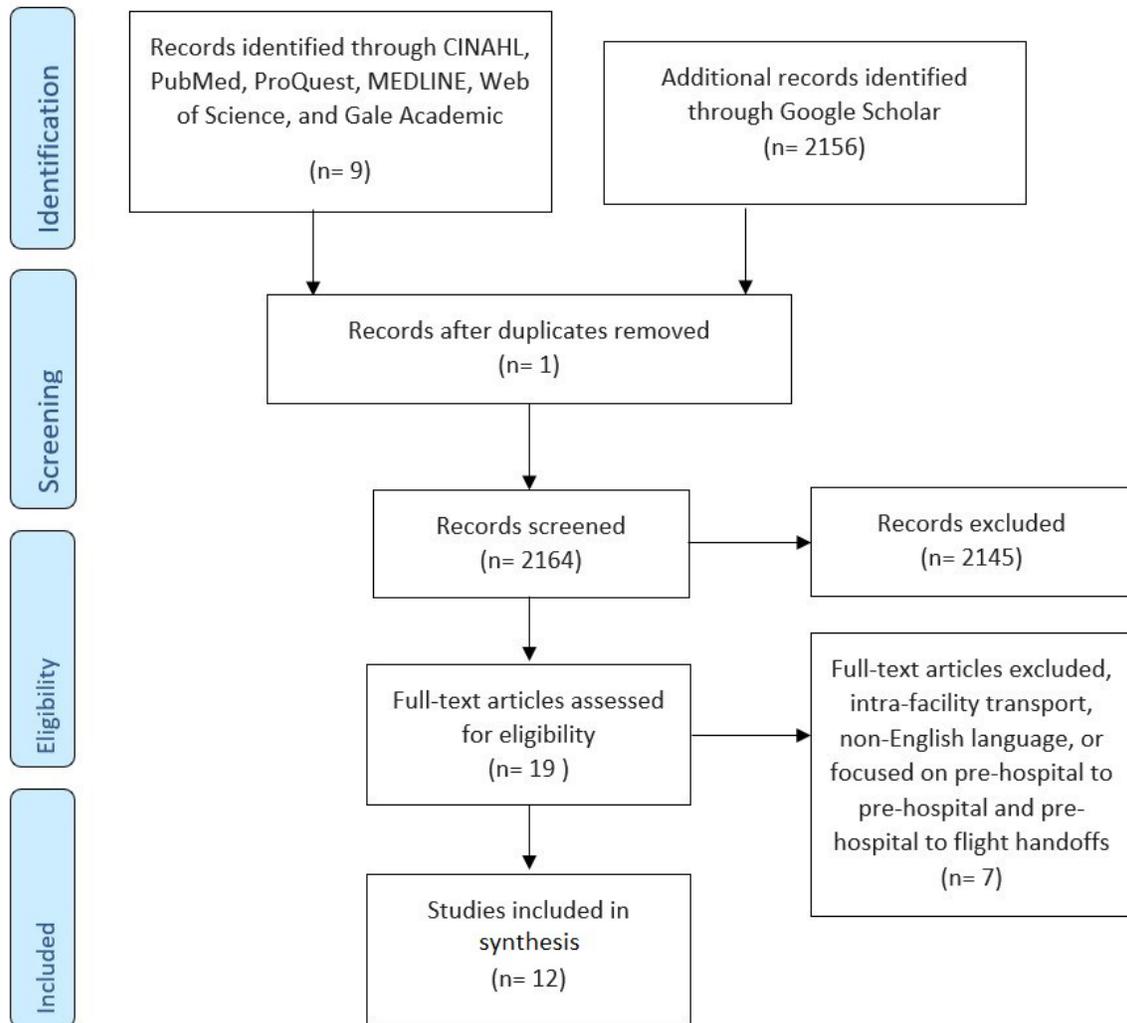
Methods

The initial terms “flight nursing,” “aeromedical,” “continuity patient care,” and “handoff” were searched via CINAHL, PubMed, ProQuest, MEDLINE, Web of Science, and Gale Academic, which produced minimal results (n = 9). The same terms were applied to Google Scholar with a significant return. This search quickly demonstrated that the terms “handoff” and

“handover” have a regionally dependent shared meaning for the transfer of patient care. Thus, future searches included “handover” and “interfacility transport” using the original databases. The term “continuum of care” with the proper Boolean operators proved less useful than anticipated. A ten-year restriction significantly truncated results. Expanded publishing dates, and citation chaining after the tertiary search yielded a comfortable body of articles.

This review used the PRISMA tool in Figure 1 to guide article inclusion and exclusion processes (Moher et al., 2009). After removing duplicates, 2,164 article titles and abstracts were screened, leaving 19 articles for full-text review. Excluded articles focused on intra-facility transport, non-English language, or focused on prehospital to prehospital, and prehospital to flight handoffs. The final appraisal rendered 12 articles for inclusion.

Figure 1. PRISMA



Results

Articles that met the review criteria included systematic reviews (Cohen & Hilligoss, 2010; Müller et al., 2018; Reimer et al., 2018), quantitative analysis (Goldberg et al., 2017), qualitative descriptive (Harmsen et al., 2017), survey questionnaire (Veldstra et al., 2015), cross-sectional descriptive (Maddry et al., 2021), mixed methods (Makkink et al., 2022), prospective observational (Maris et al., 2022), retrospective descriptive and comparative cohort study

(Sochet et al., 2018), quasi-experimental (Turkelson et al., 2020), and a quality improvement project (Wilson et al., 2017).

Two studies with sample sizes of $n=545$ and $n=11$, Cohen and Hilligoss (2010) and Müller et al. (2018), respectively, demonstrated a strong link between patient outcomes and the quality of handoff reports, demonstrating that handoffs often leave out pertinent information and improve with standardization. In a qualitative analysis, Goldberg et al. (2017) stated that only 31% of pertinent information is reported ($n=97$), which is overshadowed by Harmsen et al. (2017) in a qualitative descriptive study ($n=92$) arguing that 84% of handoff information is left out. Both studies suggested giving handoff reports after moving the patient, using a checklist, or a mnemonic as a corrective action.

In a survey questionnaire, Veldstra et al. (2015) reported that 20% of flight crews felt that they gave a thorough handoff report with every transport, 57% responded that they gave a thorough report sometimes, 15% rarely did, and 8% never gave thorough handoff reports ($n=135$). However, the handoff report from the flight crew is also influenced by the receiving facility staff. Using sequential explanatory mixed methods ($n=225$) and semi-structured interviews ($n=30$), Makkink et al. (2022) suggested that handoff is bidirectional communication and that each phase of the handoff changes as the flight crew adapts to feedback from the receiving staff.

Five studies within five years offered evidence of efficacious models to improve flight crew handoff reports. For example, in a descriptive cross-sectional article ($n=270$), Maddry et al. (2021) implemented a scripted handoff procedure and demonstrated post-implementation that in the setting of patient transfer, receiving staff felt more informed ($p<0.001$), noted improvements

in conveyed trauma ($p < 0.001$), time ($p < 0.001$), assessment findings ($p < 0.05$), clarification ($p < 0.04$), positivity ($p < 0.03$), and overall satisfaction with handoff (OR 5.5, 2.1-14.4).

Maris et al. (2022) designed a prospective observational study ($n=222$) incorporating a mnemonic during patient handoff that increased the mechanism of injury documentation to 99%, diagnosis documentation to 85%, helicopter transport events documented to 70%, and vital signs documentation to 15% ($p < 0.05$). These findings support an older quality improvement project by Wilson et al. (2017) that suggested similar mnemonics improve the quality of handoff communication ($n=93$).

The retrospective descriptive and comparative cohort study ($n=50$) by Sochet et al. (2018) and the quasi-experimental prospective pre-post repeated measures ($n=26$) by Turkelson et al. (2020) both provided evidence that standardization and checklists improve and enhance the patient handoff process. Notably, the results of implementing a checklist reduced handoff interruptions (40–10%) and increased attentiveness (82–100%, all $p < 0.01$), even up to one year post-implementation (Sochet et al., 2018).

Six excluded articles are cited in the background and discussion to provide a framework of the flight medicine environment but did not meet inclusion criteria for either a myopic interfacility transport view or a proclivity to anecdotal evidence.

Discussion

Transfer of care from prehospital services to hospital providers requires critical attention to ensure continuity of care and acutely impact patient safety (Clark, 2011; Cohen & Hilligoss, 2010; Goldberg et al., 2017; Harmsen et al., 2016; Lyng et al., 2021; Makkink et al., 2022; Maris et al., 2022; Reimer et al., 2018; Veldstra et al., 2015; Wilson et al., 2017). Nevertheless, little

research is available to offer solutions outside mnemonics and checklists. During the rush of a patient handoff, the receiving nurse, often task-saturated, can miss the opportunity to ask for additional details or clarification of events that occur during the flight itself.

Solutions have included delaying handoff until the physical transfer of the patient is complete, computer-based checklists, and mnemonics (Cohen & Hilligoss, 2010; Goldberg et al., 2017). Delaying handoff until the physical transfer of the patient is complete sounds plausible; however, many flight crews are eager to be available for their next call and avoid the “stay and play” scenario. Computer-based checklists, used during a flight, cannot remain with the bedside receiving nurse. Unfortunately, mnemonics are used inconsistently by flight crews. In addition, specific mnemonics fail to demonstrate efficacy (Goldberg et al., 2017; Harmsen et al., 2016; Muller et al., 2018; Maris et al., 2022). Nevertheless, the mnemonics SBAR (Situation, Background, Assessment, and Recommendations) and Mechanism, Injuries or Illness Identified, Signs, and Treatment (MIST) have been shown to assist with accurate and timely handoff reports (Cohen & Hilligoss, 2010; Maddry et al., 2021; Wilson et al., 2017). Studies demonstrate a repetitive theme that flight crews and receiving staff consider scripted guidelines to improve handoff (Cohen & Hilligoss, 2010; Maddry et al., 2021; Reimer et al., 2018; Sochet et al., 2018; Spruce, 2016; Veldstra et al., 2015).

While the evidence suggests mnemonics improve handoff, few agencies in Western Montana and Idaho mandate these practices. The mixed results of other mnemonics suggest that a more thorough and deliverable form of report is needed. In addition, human memory is unreliable in high-stress and rapidly changing environments. For example, one study reported

that physicians could only remember 36% of verbal patient reports during handoff (Scott et al., 2003; Turkelson et al., 2020).

A written document (drop sheet) native to the flight crew is a solution, ideally modeled after the most efficacious mnemonics, SBAR or MIST, including the often-forgotten transport vital signs. One obvious advantage of using this document is surmounting the loud and noisy environment that negatively influences effective communication (Cram et al., 2017). Also, the bedside receiving nurse would have a chance to look at the document at a later time once the patient is settled. A so-called drop sheet would include essential information elements such as patient demographics, time of the incident, mechanism of injury or nature of the illness, assessment, interventions, vital signs, and coma scale (Reimer et al., 2018). A web-based survey tool would broadly ask for receiving nurses' comfort during the handoff and whether each essential informational element was provided. Such a document would secondarily function as a checklist, as populating its fields would prompt the flight crew to attend to the nurses' responses. Checklists or a standardized approach to delivering patients to nursing staff reduce the likelihood of pertinent patient information omission or human error (Cohen & Hiligoss, 2010; Reimer et al., 2018; Sochet et al., 2018; Spruce, 2016; Turkelson et al., 2020; Wilson et al., 2017). Drop sheet design is essential, particularly in the flight environment. In addition, flight crew compliance will provide opportunities for design improvement.

Conclusions

Standardizing a physical document formatted after a field-tested mnemonic inclusive of all pertinent patient information for flight medical transports can dually increase and measure the comfort of the bedside receiving nurse and enhance patient safety.

Implications and Policy

At least one university in the United States offers a flight medicine subspecialty in their advanced practice nursing curriculum, suggesting that more advanced practice RNs (APRNs) will practice in the field (Alfes et al., 2015). APRNs, therefore, are at an advantage in championing a flight crew drop sheet for the receiving nurse. Providing and tailoring a rapid Likert-type scale survey (web-based) in addition to the drop sheet that measures positive change is particularly important to determine effectiveness.

References

- Alfes, C. M., Steiner, S. L., & Manacci, C. F. (2015). Critical care transport training: New strides in simulating the austere environment. *Air medical journal.*, 34(4), 186-187. doi:10.1016/j.amj.2015.03.006
- Clark, D. (2011). Rapid emergency admission to destination initiative (READi)—Improving documentation, clinical handover and patient transfer times from emergency department to inpatient beds. *Australasian emergency nursing journal : AENJ.*, 14, S8-S9. doi:10.1016/j.aenj.2011.09.024
- Cohen, M. D., & Hilligoss, P. B. (2010). The published literature on handoffs in hospitals: deficiencies identified in an extensive review. *Quality & safety in health care.*, 19(6), 493-497. doi:10.1136/qshc.2009.033480
- Cram, N., McLeod, S., Lewell, M., & Davis, M. (2017). A prospective evaluation of the availability and utility of the ambulance call record in the emergency department. *Canadian journal of emergency medicine*, 19(2), 81-87. doi:10.1017/cem.2016.362
- Goldberg, S. A., Porat, A., Strother, C. G., Lim, N. Q., Wijeratne, H. R. S., Sanchez, G., & Munjal, K. G. (2017). Quantitative analysis of the content of EMS handoff of critically ill and injured patients to the emergency department. *Prehospital emergency care.*, 21(1), 14-17. doi:10.1080/10903127.2016.1194930

- Harmsen, A. M. K., Giannakopoulos, G., Franschman, G., Christiaans, H., & Bloemers, F. (2017). Limitations in prehospital communication between trauma helicopter, ambulance services, and dispatch centers. *The Journal of emergency medicine*, 52(4), 504-512. doi:10.1016/j.jemermed.2016.11.010
- Lyng, J. W., Braithwaite, S., Abraham, H., Brent, C. M., Meurer, D. A., Torres, A., . . . Larrimore, A. (2021). Appropriate air medical services utilization and recommendations for integration of air medical services resources into the EMS system of care: A joint position statement and resource document of NAEMSP, ACEP, and AMPA. *Prehospital emergency care*, 25(6), 854-873. doi:10.1080/10903127.2021.1967534
- Maddry, J. K., Simon, E. M., Reeves, L. K., Mora, A. G., Clemons, M. A., Shults, N. M., . . . Walrath, B. D. (2021). Impact of a standardized patient handoff tool on communication between emergency medical services personnel and emergency department staff. *Prehospital emergency care*, 25(4), 530-538. doi:10.1080/10903127.2020.1808745
- Makkink, A. W., Stein, C. O. A., & Bruijns, S. R. (2022). The prehospital to emergency department hand over model (PEDHOM): a conceptual model addressing content, process, and communication in prehospital to emergency department handover, 14 April 2022, PREPRINT (Version 2) available at Research Square [https://doi.org/10.21203/rs.3.rs-1418631/v2]
- Maris, M., Berben, S. A. A., Verhoef, W., van Grunsven, P., & Tan, E. C. T. H. (2022). The quality of pre-announcement communication and the accuracy of estimated arrival time in critically ill patients, a prospective observational study. *BMC emergency medicine*, 22(1), 1. doi:10.1186/s12873-022-00601-z
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ*, 339(7716), 332-336. doi:10.1136/bmj.b2535
- Müller, M., Jürgens, J., Redaelli, M., Klingberg, K., Hautz, W. E., & Stock, S. (2018). Impact of the communication and patient handoff tool SBAR on patient safety: a systematic review. *BMJ open*, 8(8), e022202.
- Reimer, A. P., Alfes, C. M., Rowe, A. S., & Rodriguez-Fox, B. M. (2018). Emergency patient handoffs: Identifying essential elements and developing an evidence-based training Tool. *The Journal of continuing education in nursing*, 49(1), 34-41. doi:10.3928/00220124-20180102-08

- Scott, L. A., Brice, J. H., Baker, C. C., & Shen, P. (2003). Analysis of paramedic verbal reports to physicians in the emergency department trauma room. *Prehospital emergency care.*, 7(2), 247-251. doi:10.1080/10903120390936888
- Sochet, A. A., Ryan, K. S., Miller, W., Bartlett, J. L., Nakagawa, T. A., & Bingham, L. (2018). A longitudinal and sustainability assessment of pediatric interfacility transport handover standardization. *Pediatric quality & safety*, 3(6), e118-e118. doi:10.1097/pq9.0000000000000118
- Spruce, L. (2016). Back to basics: Patient care transitions. *AORN Journal*, 104(5), 426-432. doi:https://doi.org/10.1016/j.aorn.2016.08.014
- Turkelson, C., Keiser, M., Sculli, G., & Capoccia, D. (2020). Checklist design and implementation: critical considerations to improve patient safety for low-frequency, high-risk patient events. *BMJ simulation & technology enhanced learning*, 6(3), 148-157. doi:10.1136/bmjstel-2018-000353
- Veldstra, J., Raingruber, B., Billings, L., Dennis, A., Ver Steeg, P., Hansen, Y., Wells, J., Allen, C., Heitmeyer, J., Olmstead, H. A., Chavez, A., Blackson, C., Koplín, H., Seaters, D. (2015). The perspectives of emergency personnel regarding ways to improve trauma patient handoffs in the resuscitation room. *J J Nurse Care*, 1(2): 007.
- Wilson, D., Kochar, A., Whyte-Lewis, A., Whyte, H., & Lee, K.-S. (2017). Evaluation of situation, background, assessment, recommendation tool during neonatal and pediatric interfacility transport. *Air Medical Journal*, 36(4), 182-187. doi:10.1016/j.amj.2017.02

CHAPTER TWO

PROJECT PROPOSAL

Introduction and Problem

Inconsistent handoff report to receiving nursing staff is a pervasive theme in flight medicine. For example, less than half of pertinent patient information is provided (Goldberg et al., 2017), only 16% of care transfers were considered complete (Harmsen et al., 2017), and flight crews reported 57.04% that “sometimes” they were able to give a thorough report (Veldstra et al., 2015). This discrepancy is problematic because patient handoff reports from the flight crew directly impact patient safety and continuity of care (Makkink et al., 2022; Maris et al., 2022; Muller et al., 2018; Turkelson et al., 2020). However, mnemonics, checklists, and standardization promise improvement (Cohen & Hiligoss, 2010; Maddry et al., 2021; Reimer et al., 2018; Sochet et al., 2018; Spruce, 2016; Turkelson et al., 2020; Wilson et al., 2017). A proposed document to maintain the integrity of continuity of care during patient handoff in the flight environment can be achieved by implementing a drop sheet.

Problem Statement

There is a potential patient safety problem due to inadequate flight crew handoff reports. Unfortunately, little research supports the solutions discovered in the literature review. However, a select few mnemonics and checklists combined into a standardized scripted report have shown improved patient safety and increased receiving nurses’ comfort level with the handoff. A drop sheet modeled after a validated mnemonic, including pertinent patient information (i.e., vital signs, drug drip rates, or ventilator settings), can help achieve the goal of a more thorough

handoff report. Once the drop sheet has been instituted, the flight crew will offer a survey to the receiving nurse to measure the sheet's effectiveness.

Organizational Microsystem Assessment

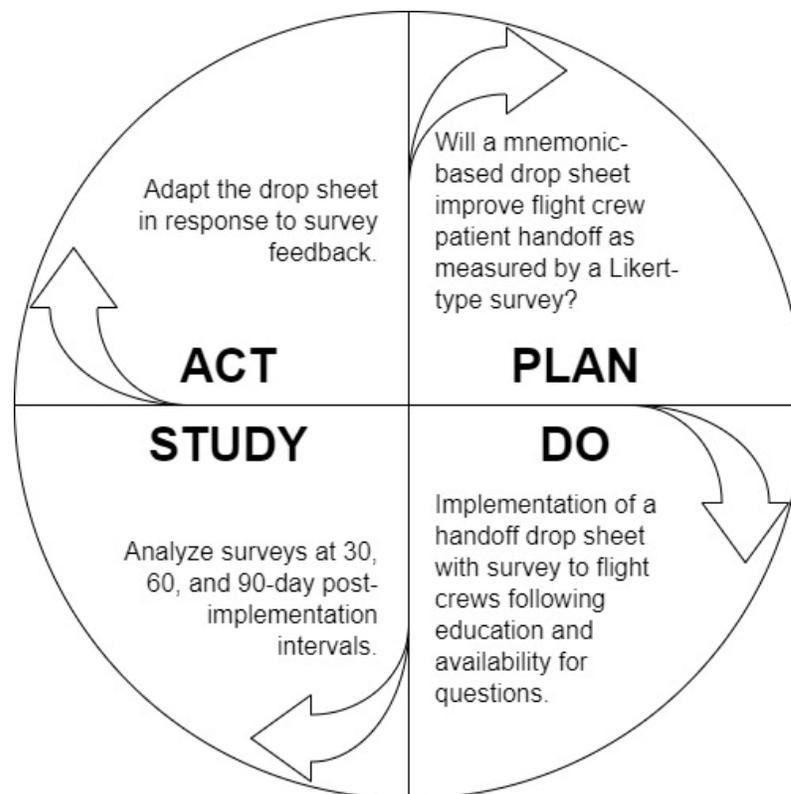
Montana Administrative Rule for Emergency Medical Services 37.104.212 states that an abbreviated patient encounter must be left until the full report can be provided no later than 24 hours after flight crew arrival. Currently, these patient encounters are grossly under-submitted. In response, a Western Montana flight medical company is currently using a web-based survey to attempt to gain insight into their handoff performance. The current survey focuses on the receiving nurses' satisfaction with the flight team's performance and uses open-ended, free-text responses. Questions are related to how the flight team can improve patient handoffs. There are two problems with this type of survey. First, a web-based survey does not encourage receiving nurses who are busy settling the patient to complete the survey once the patient is settled. Second, a free-text, in-totality survey requires thematic coding and work hours for data analysis. A paper, Likert-type survey that can be completed during handoff and returned to the flight team could improve feedback frequency and utility.

Rationale

The Plan, Do, Study, Act (PDSA) model in Figure 2 will be used for flight crew process improvement at a Western Montana flight medical company. The first step in planning is to create a drop sheet formatted after a valid mnemonic, including often omitted pertinent patient information (Cohen & Hiligoss, 2010; Maddry et al., 2021; Wilson et al., 2017). This sheet will also have a tear-off, simple Likert-type survey with four questions and a free-text comment area

to be completed by the receiving nurse during the handoff and returned to the flight crew at transfer of care. The second step is for flight crews to implement the drop sheet during patient handoff. This standardized script will maintain the integrity of continuity of care by prompting pertinent patient information for the flight crew. It will be left with the receiving nurse for later reference. In addition, flight crews will collect the feedback surveys from the receiving staff and deposit them at the hangar for later review and assessment in the third step. During this third step, returned surveys will be reviewed and assessed, and depending on the survey results, the drop sheet will be modified if needed. Finally, changes in flight crew practice will reflect survey feedback through appraisal and review with the student, service director, and medical director during the company's monthly staff meetings.

Figure 2. Plan Do Study Act Model



Specific Aims

Implementing a drop sheet for flight crew during patient handoff can positively influence the handoff process. The short-term goal will provide the drop sheet to the flight crews on January 2, 2023, with 95% of the flight crews using the sheet by the end of the month. A rolling intermediate goal will assess the responses from the Likert-type scale surveys at 30, 60, and 90 days from drop sheet implementation. A secondary intermediate goal will be to adjust the drop sheet if pervasive and actionable themes are noted on the survey. By April 2023, improved patient handoff by all scale ratings above three is anticipated as measured by the survey.

Context

This Western Montana flight medical company includes the aviation component (i.e., pilots, mechanics, line staff) and clinicians (i.e., nurses and paramedics). The key stakeholders are the nurses, paramedics, the service director, and the parent company. Patients are typically collected from Western Montana hospitals, critical access hospitals, and emergency medical services. Patients are subsequently transported via fixed-wing aircraft to level I or level II hospitals and out-of-state university hospitals.

Intervention and Implementation

Flight crews will carry a drop sheet completed at any time during the transport, but no later than departure from the receiving facility. The drop sheet will be formatted off a mnemonic and include specific pertinent patient information items such as diagnosis, vital signs, drug drip rates, and ventilator settings. In addition, the drop sheet will include a Likert-type scale survey

with a few questions regarding the nurse's comfort and the handoff report's completeness. This survey will be completed and returned to the flight crew. These surveys will be collected at the hangar by the service director. During the first few weeks of implementation, daily opportunities will be provided to answer questions and guidance as needed from the service director.

Beginning January 2023, flight crews will be trained to use and implement the drop sheet and the survey collection. By the end of January, the goal is to have this sheet used for 95% of the flight medicine company's transports. Moving forward, 30 days post-implementation, collected surveys will be analyzed, and appropriate feedback will be provided to the flight crews. In addition, needed changes will be applied to the drop sheet and survey. This process will be repeated at the 60-day mark (March 2023) and the 90-day mark (April 2023).

By April 2023, survey feedback will demonstrate an improved score for receiving RN comfort with handoff, completeness of the report, and improved performance via flight crew self-assessment. Surveys will not contain any personally identifiable information.

Implementation costs will be the production costs for a three-page carbon copy single-sided document. Barriers to this quality improvement project will be the acceptance of the flight crew to execute an additional task during transport and the willingness of the receiving nurse to complete the survey. Additionally, while the literature identifies scripted handoff as a way to enhance patient safety, it is difficult to measure long-term patient outcomes after handoff has occurred.

Evaluation

At the complete implementation of this project in April 2023, the flight crews will continue to use the drop sheet and survey. After four months of experience, the flight crews and

service director will likely be comfortable making their own changes and training future new hires in its use and purpose.

Table 1. SMART Goals

<p>SMART Goal #1: Up to 50% of pertinent patient information is unintentionally omitted during handoff from flight teams to receiving facility staff. Montana Administrative Rule for EMS 37.104.212 states that an abbreviated patient encounter must be left until the full report can be provided no later than 24 hours after arrival.</p>		
<p>Description of strategies to be utilized to accomplish goal including any needed resources:</p> <ul style="list-style-type: none"> • A drop sheet will be a single-side printed 8.5x11 triplicate carbon copy document. • The drop sheet will be completed by the flight nurse or flight paramedic at any time during the patient transport prior to arrival to the receiving facility. • Drop sheet carbon copies will be given to the bedside receiving nurse or left in a conspicuous place. One carbon copy is to be retained by the flight crew and returned to the hangar. 		
<p>Data to be collected</p>	<p>Method of Collection and who is responsible</p>	<p>Planned data analysis</p>
<p>Flight crew compliance.</p>	<p>Assessing the number of returned carbon copies against the flight log.</p>	<p>Percentage of completion and use.</p>

Table 1 Continued

<p>SMART Goal #2: Education, implementation, and use of the drop sheet by the flight crews (nurse and paramedic) in winter 2022/2023.</p> <p>Description of strategies to be utilized to accomplish goal including any needed resources:</p> <ul style="list-style-type: none"> • A protocol for drop sheet use will be published in the hangar's clinical practice guidelines binder available to all staff members. • Education will be completed in December 2022 and January 2023 prior to drop sheet implementation. • Service director is the direct contact for information to ask for clarification or give feedback at any time. A response will be provided within two business days. • Attend monthly staff meetings in order to sync with flight crews face-to-face. 		
Data to be collected	Method of Collection and who is responsible	Planned data analysis
Fight crew understanding of drop sheet use and survey.	Weekly communication with flight service director.	Descriptive discussions and flight crew comfort.

Table 1 Continued

SMART Goal #3: Assess the use of the drop sheet by the flight crews. Measure the completeness, timeliness, and crew's communication efficacy to the receiving facility staff.		
Description of strategies to be utilized to accomplish goal including any needed resources:		
<ul style="list-style-type: none"> • Each carbon copy sheet will have a web-based code on it that leads to a follow-up survey. In addition, a prepaid, self-addressed postcard will be left with the swag bag. • Every survey will be the same using a Likert-type scale asking the survey-taker to rate the patient handoff for report completeness, report timeliness, patient handoff, crew's communication, and a space for free-text comments. 		
<ul style="list-style-type: none"> • Surveys will be assessed weekly in January. This schedule will be liberalized if deemed appropriate at 30 days post-implementation. 		
Data to be collected	Method of Collection and who is responsible	Planned data analysis
Completeness, handoff, timeliness, communication, and feedback.	Likert-type scale survey and free-text.	Parametric tests.

References

- Cohen, M. D., & Hilligoss, P. B. (2010). The published literature on handoffs in hospitals: deficiencies identified in an extensive review. *Quality & safety in health care.*, 19(6), 493-497. doi:10.1136/qshc.2009.033480
- Goldberg, S. A., Porat, A., Strother, C. G., Lim, N. Q., Wijeratne, H. R. S., Sanchez, G., & Munjal, K. G. (2017). Quantitative analysis of the content of EMS handoff of critically ill and injured patients to the emergency department. *Prehospital emergency care.*, 21(1), 14-17. doi:10.1080/10903127.2016.1194930
- Harmesen, A. M. K., Giannakopoulos, G., Franschman, G., Christiaans, H., & Bloemers, F. (2017). Limitations in prehospital communication between trauma helicopter, ambulance

- services, and dispatch centers. *The Journal of emergency medicine.*, 52(4), 504-512. doi:10.1016/j.jemermed.2016.11.010
- Maddry, J. K., Simon, E. M., Reeves, L. K., Mora, A. G., Clemons, M. A., Shults, N. M., . . . Walrath, B. D. (2021). Impact of a standardized patient handoff tool on communication between emergency medical services personnel and emergency department staff. *Prehospital emergency care*, 25(4), 530-538. doi:10.1080/10903127.2020.1808745
- Makkink, A. W., Stein, C. O. A., & Bruijns, S. R. (2022). The prehospital to emergency department hand over model (PEDHOM): a conceptual model addressing content, process, and communication in prehospital to emergency department handover, 14 April 2022, PREPRINT (Version 2) available at Research Square [https://doi.org/10.21203/rs.3.rs-1418631/v2]
- Maris, M., Berben, S. A. A., Verhoef, W., van Grunsven, P., & Tan, E. C. T. H. (2022). The quality of pre-announcement communication and the accuracy of estimated arrival time in critically ill patients, a prospective observational study. *BMC emergency medicine.*, 22(1), 1. doi:10.1186/s12873-022-00601-z
- Müller, M., Jürgens, J., Redaelli, M., Klingberg, K., Hautz, W. E., & Stock, S. (2018). Impact of the communication and patient handoff tool SBAR on patient safety: a systematic review. *BMJ open*, 8(8), e022202.
- Sochet, A. A., Ryan, K. S., Miller, W., Bartlett, J. L., Nakagawa, T. A., & Bingham, L. (2018). A longitudinal and sustainability assessment of pediatric interfacility transport handover standardization. *Pediatric quality & safety*, 3(6), e118-e118. doi:10.1097/pq9.000000000000118
- Spruce, L. (2016). Back to basics: Patient care transitions. *AORN Journal*, 104(5), 426-432. doi:https://doi.org/10.1016/j.aorn.2016.08.014
- Turkelson, C., Keiser, M., Sculli, G., & Capoccia, D. (2020). Checklist design and implementation: critical considerations to improve patient safety for low-frequency, high-risk patient events. *BMJ simulation & technology enhanced learning*, 6(3), 148-157. doi:10.1136/bmjstel-2018-000353
- Veldstra, J., Raingruber, B., Billings, L., Dennis, A., Ver Steeg, P., Hansen, Y., Wells, J., Allen, C., Heitmeyer, J., Olmstead, H. A., Chavez, A., Blackson, C., Koplín, H., Seaters, D. (2015). The perspectives of emergency personnel regarding ways to improve trauma patient handoffs in the resuscitation room. *J J Nurse Care*, 1(2): 007.
- Wilson, D., Kochar, A., Whyte-Lewis, A., Whyte, H., & Lee, K.-S. (2017). Evaluation of situation, background, assessment, recommendation tool during neonatal and pediatric interfacility transport. *Air Medical Journal*, 36(4), 182-187. doi:10.1016/j.amj.2017.02

CHAPTER THREE

MEDICAL FLIGHT HANDOFF QUALITY IMPROVEMENT

Flight medicine usually involves the highest acuity patients because flight transport is roughly three times faster than ground transportation, and aircraft can surmount time-consuming geographical features. However, several studies have demonstrated that flight crews omit up to 50% of pertinent patient information during handoff (Goldberg et al., 2017; Harmsen et al., 2017; Maris et al., 2022). It is difficult to say what leads to an inadequate handoff in flight medicine. Limitations in diagnostics, urgent and ongoing patient needs, and various sending-receiving facilities, flight platforms, and crew members create a challenging environment. To mitigate these challenges, the literature argues that a handoff tool can help, but few have been rigorously studied (Cohen & Hilligoss, 2010; Maddry et al., 2021; Reimer et al., 2018; Sochet et al., 2018; Spruce, 2016; Veldstra et al., 2015).

According to the literature, the mnemonics that receive the most support in regard to the development of a handoff tool are SBAR and MIST (Cohen & Hiligoss, 2010; Maddry et al., 2021; Wilson et al., 2017). Leaving a physical document with the receiving care team is a critical addition to verbal reporting and is now a legal requirement per Montana Administrative Rule for Emergency Medical Services 37.104.212.

Literature Review

Transfer of care from flight medical services to hospital providers requires critical attention to ensure continuity of care and patient safety (Clark, 2011; Cohen & Hilligoss, 2010; Goldberg et al., 2017; Harmsen et al., 2016; Lyng et al., 2021; Makkink et al., 2022; Maris et al.,

2022; Reimer et al., 2018; Veldstra et al., 2015; Wilson et al., 2017). In addition, studies demonstrate a repetitive theme that flight crews and receiving staff should consider a scripted guideline to improve patient handoffs (Cohen & Hilligoss, 2010; Maddry et al., 2021; Reimer et al., 2018; Sochet et al., 2018; Spruce, 2016; Veldstra et al., 2015).

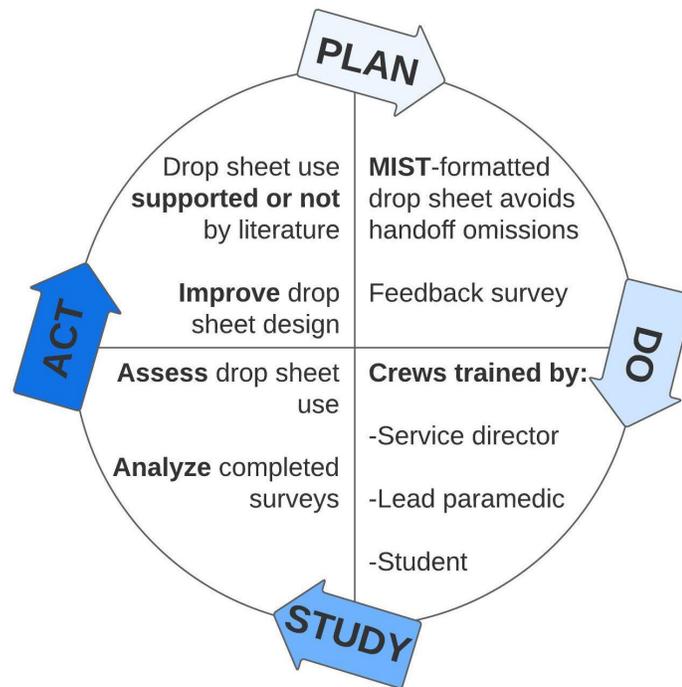
The mixed results of some handoff forms using mnemonics indicate that a more thorough and deliverable form of report is needed. In addition, human memory is less reliable in high-stress and rapidly changing environments like intensive care units or emergency departments, where a majority of flight care patients are delivered. For example, one study reported that physicians could only remember 36% of verbal patient reports during handoff (Scott et al., 2003; Turkelson et al., 2020). In light of this evidence, a quality improvement project was initiated to create a useful drop-off sheet to be used during patient transport intended to increase the likelihood of pertinent patient information being provided to receiving care teams.

Methods

The Plan Do Study Act (PDSA) framework provided the basis for this quality improvement project with a small flight medical company in the Northern Rockies. PDSA (Figure 3) was the ideal experimental model because it features micro-iterations of the project that allowed for flexibility and changes. The Plan phase included the drop sheet development, with the associated Likert-type survey. During this phase, the QI lead and other team members created the drop sheet. All flight crew members were taught how to complete the sheet by the QI lead, service director, and lead paramedic on drop sheet use. This education was initially provided by the QI lead during the January staff meeting and was also available to crew members at any time by the service director or lead paramedic. The Do phase encompassed the

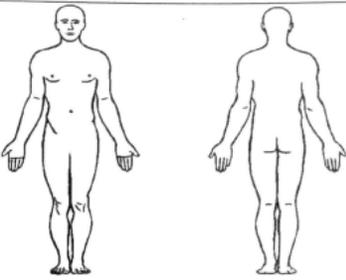
ongoing education and implementation of the drop sheet. The Study phase monitored drop sheet compliance and survey analysis. The Act phase was intended to allow for the adaptation of the drop sheet in response to drop sheet compliance and survey feedback. This phase began upon rollout and continued through mid-March. During this time, the flight crew completed and returned to the hangar, where they were stored in a secure location. These completed drop sheets were counted weekly, and this count was compared against the flight log. In addition, a survey was included at the end of the drop sheet for the receiving team to complete thereby providing feedback to the flight crew regarding drop sheet utility. The QI lead maintained contact with the flight medical company's service director weekly and attended monthly staff meetings following the drop sheet's rollout on January 10^t, 2023.

Figure 3. PDSA



With the help of the service director and the flight crews during their pre-rollout staff meetings, the drop sheet's contents were tailored to include diagnosis, history, an anatomical diagram, vital signs, drug drip rates, ventilator settings, and other interventions such as orogastric tubes (Figure 4).

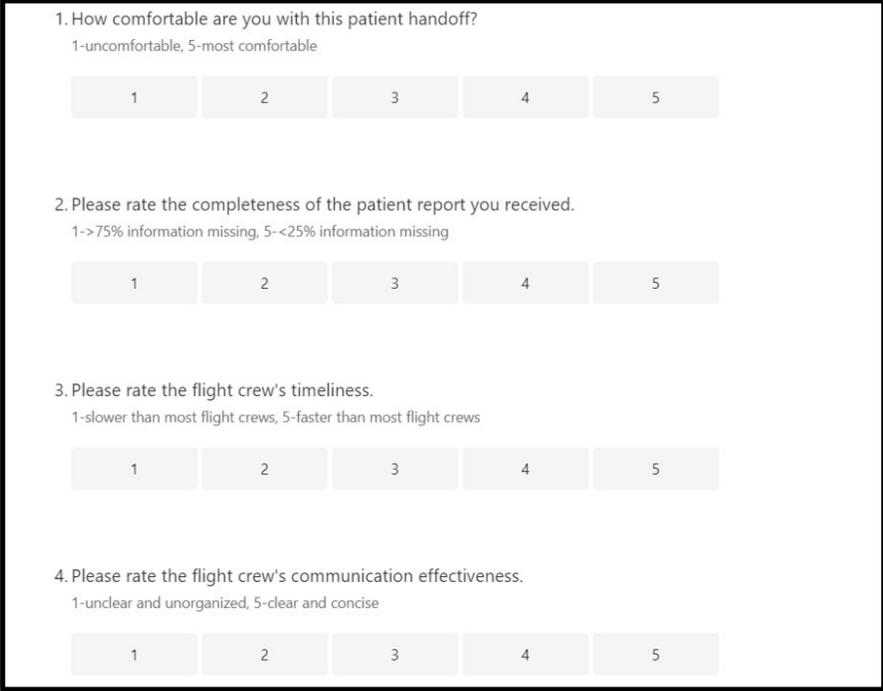
Figure 4. Original Drop Sheet Design

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How did we do? Please complete the survey by scanning the barcode.																																																																		

A two-page, single-sided carbon copy drop sheet following the MIST mnemonic was printed with a QR code at the bottom and linked to an online Likert-style survey. The drop sheets were serialized for tracking purposes. The Northern Rockies flight company service director and QI project lead educated the flight crews on drop sheet use and verified learning via the teach-back method at the time of education. The Likert-type survey was viewed online in desktop and mobile formats (Figure 5). Each question had five options, one being least desirable and five most desirable:

- 1) How comfortable are you with this patient handoff?
- 2) Please rate the completeness of the patient report you received.
- 3) Please rate the flight crew's timeliness.
- 4) Please rate the flight crew's communication effectiveness.

Figure 5. Likert-Type Survey



The image shows a screenshot of a Likert-type survey with four questions, each followed by a five-point scale. The questions and their corresponding scales are:

- 1. How comfortable are you with this patient handoff?
1-uncomfortable, 5-most comfortable
Scale: 1, 2, 3, 4, 5
- 2. Please rate the completeness of the patient report you received.
1->75% information missing, 5-<25% information missing
Scale: 1, 2, 3, 4, 5
- 3. Please rate the flight crew's timeliness.
1-slower than most flight crews, 5-faster than most flight crews
Scale: 1, 2, 3, 4, 5
- 4. Please rate the flight crew's communication effectiveness.
1-unclear and unorganized, 5-clear and concise
Scale: 1, 2, 3, 4, 5

Intervention

The PDSA model was used to guide the drop sheet implementation process. Before the drop sheet was implemented, the QI lead trained the service director and lead paramedic instructor in drop sheet completion and access to the web-based surveys. The QI lead also gave an in-service to the flight crews during their monthly staff meetings. When questions arose after the in-service, the service director and lead paramedic acted as a readily available resource for the flight crews, but flight crews had very few questions during the study period. A short-term goal of 95% drop sheet utilization by the end of March was established. Completion of the drop sheet by the flight crew could occur at any time during the transport but before leaving the receiving facility. IRB approval was obtained from Montana State University prior to the project start date.

Results

The drop sheet launch occurred on January 10, 2023, and data collection continued for 60 days. A goal of 95% drop sheet utilization was established at the beginning of the study. From the launch date through the end of January, 38 flights were completed, and 20 drop sheets were used, resulting in 52.6% use compliance. In February, 20 flights were completed, and 18 drop sheets were used, resulting in 90% use compliance. Six flights were completed until March 10, 2023, and five drop sheets were used, resulting in 83% use compliance (Table 2). Overall drop sheet compliance was 67%, which is below the planned use compliance goal but signifies progress toward meeting the goal of improved patient handoffs for flight crews. While the surveys used in the study were intended to provide information related to the drop sheet handoff

process, only four surveys were completed. All four surveys rated their flight crew’s Likert-type questions as a five or “most desirable.”

Table 2. Results

Dates (2023)	Flights	Drop sheets used	Use percentage	Completed surveys
January 10-31	38	20	53%	2
February 1-28	20	18	90%	2
March 1-10	6	5	83%	0
Totals	64	43	67%	4

Discussion

The original 95% drop sheet use compliance goal was not met after 60 days post-implementation. However, 67% of the time the dropsheet was utilized, which can be considered a success because prior to implementation, no drop sheets were used; no patient information was left with the receiving care team. Feedback from flight crews regarding the drop sheet was obtained during the company’s monthly staff meetings. One recurrent theme reported by the flight crews was that the drop sheet helped organize their handoff report to the bedside nurse, even when it was unclear if the receiving nurse reviewed the drop sheet. The simplicity of the drop sheet design and its use created a smooth process. When the drop sheet was not used, the crew reported that either they forgot or that urgent patient needs took priority. Distraction from

documentation by the patient's ongoing needs is common in flight medicine (Goldberg et al., 2017; Veldstra et al., 2015; Maris et al., 2022).

Improvement of compliance percentages for the drop sheet could depend on a variety of factors to include greater emphasis on the new legal requirements for the state and increased service director support. Evidence also supports the involvement of flight crew staff during monthly meetings leading up to and during implementation when planning for and implementing drop sheets for improved patient handoffs can greatly decrease confusion and increase utilization (Cohen & Hilligoss, 2010; Maddry et al., 2021; Reimer et al., 2018; Sochet et al., 2018; Spruce, 2016; Veldstra et al., 2015). For example, listing pertinent patient information incorrectly on the form or posting information in the wrong section of the form can be prevented if the crew members are included in the drop sheet development and also reduces the likelihood of omitting pertinent patient information (Cohen & Hiligoss, 2010; Reimer et al., 2018; Sochet et al., 2018; Spruce, 2016; Turkelson et al., 2020; Wilson et al., 2017).

Improvement of compliance percentages for the survey, which had a 9.3% completion rate, was discussed by the flight crew, and three solutions were offered to improve the survey completion rate. The first suggestion was moving the QR code from the bottom of the drop sheet to the middle and making it more visible to the receiving staff. The company's service director reported that many flight crews pointed out the QR code to receiving staff and sometimes even circled or drew an arrow on the drop sheet to draw attention to the survey.

A second suggestion was to attach the QR code on a tag to a swag bag. A swag bag is a tactic many flight companies already use; typically, they contain candy or small items with the company's name or logo, which could lead to biased responses. The third option was to leave a

self-addressed postcard with the survey that can be completed and mailed back to the hangar later, anecdotally supported by the minimum effort needed to complete the survey and place it in an outbox at the receiving facility. Finally, the survey questions could more clearly address the values and mission statements of the Northern Rockies flight company. The reworded survey questions would use the same Likert-type rating scale, and the new questions would be as follows:

1. How complete was the communication you received from the flight crew?
2. How appropriately do you feel the flight crew managed this patient?
3. Was the patient handled safely and professionally?
4. How thoroughly did the flight crew convey knowledge and confidence in patient management?
5. How likely are you to recommend *this Northern Rockies flight company*?

Limitations

The returned survey sample size was the most significant limitation of this quality improvement project. The second most significant limitation was drop sheet use compliance. Either the initial goal needs to be lowered, or increased support to the flight crews to enhance drop sheet use is required. As aforementioned, separating the survey from the drop sheet, such as a postcard or attached to a swag bag, may help determine if the patient handoffs lacking a drop sheet score differently on the Likert-type scale.

Conclusion

The omission of pertinent patient information is a common problem during patient handoff in the flight medicine industry. Implementing a supplemental document to verbal reports, such as a drop sheet, can enhance flight crew handoff completeness. A drop sheet, utilizing the MIST mnemonic, acted in the way of a checklist and provided the opportunity for a complete patient handoff report. The Northern Rockies flight company has implemented an initial drop sheet to address patient handoff omissions. The flight medical industry needs to find creative ways to increase use compliance, improve survey completion, and reword survey questions to garner rich feedback on their performance.

References

- Clark, D. (2011). Rapid emergency admission to destination initiative (READi)—Improving documentation, clinical handover, and patient transfer times from the emergency department to inpatient beds. *Australasian emergency nursing journal: AENJ.*, *14*, S8-S9. doi:10.1016/j.aenj.2011.09.024
- Cohen, M. D., & Hilligoss, P. B. (2010). The published literature on handoffs in hospitals: deficiencies identified in an extensive review. *Quality & safety in health care.*, *19*(6), 493-497. doi:10.1136/qshc.2009.033480
- Goldberg, S. A., Porat, A., Strother, C. G., Lim, N. Q., Wijeratne, H. R. S., Sanchez, G., & Munjal, K. G. (2017). Quantitative analysis of the content of EMS handoff of critically ill and injured patients to the emergency department. *Prehospital emergency care.*, *21*(1), 14-17. doi:10.1080/10903127.2016.1194930
- Harmsen, A. M. K., Giannakopoulos, G., Franschman, G., Christiaans, H., & Bloemers, F. (2017). Limitations in prehospital communication between trauma helicopter, ambulance services, and dispatch centers. *The Journal of emergency medicine.*, *52*(4), 504-512. doi:10.1016/j.jemermed.2016.11.010

- Lyng, J. W., Braithwaite, S., Abraham, H., Brent, C. M., Meurer, D. A., Torres, A., . . . Larrimore, A. (2021). Appropriate air medical services utilization and recommendations for integration of air medical services resources into the EMS system of care: A joint position statement and resource document of NAEMSP, ACEP, and AMPA. *Prehospital emergency care.*, 25(6), 854-873. doi:10.1080/10903127.2021.1967534
- Maddry, J. K., Simon, E. M., Reeves, L. K., Mora, A. G., Clemons, M. A., Shults, N. M., . . . Walrath, B. D. (2021). Impact of a standardized patient handoff tool on communication between emergency medical services personnel and emergency department staff. *Prehospital emergency care*, 25(4), 530-538. doi:10.1080/10903127.2020.1808745
- Makkink, A. W., Stein, C. O. A., & Bruijns, S. R. (2022). The prehospital to emergency department hand over model (PEDHOM): a conceptual model addressing content, process, and communication in prehospital to emergency department handover, 14 April 2022, PREPRINT (Version 2) available at Research Square [https://doi.org/10.21203/rs.3.rs-1418631/v2]
- Maris, M., Berben, S. A. A., Verhoef, W., van Grunsven, P., & Tan, E. C. T. H. (2022). The quality of pre-announcement communication and the accuracy of estimated arrival time in critically ill patients, a prospective observational study. *BMC emergency medicine.*, 22(1), 1. doi:10.1186/s12873-022-00601-z
- Reimer, A. P., Alfes, C. M., Rowe, A. S., & Rodriguez-Fox, B. M. (2018). Emergency patient handoffs: Identifying essential elements and developing an evidence-based training Tool. *The Journal of continuing education in nursing.*, 49(1), 34-41. doi:10.3928/00220124-20180102-08
- Scott, L. A., Brice, J. H., Baker, C. C., & Shen, P. (2003). Analysis of paramedic verbal reports to physicians in the emergency department trauma room. *Prehospital emergency care.*, 7(2), 247-251. doi:10.1080/10903120390936888
- Sochet, A. A., Ryan, K. S., Miller, W., Bartlett, J. L., Nakagawa, T. A., & Bingham, L. (2018). A longitudinal and sustainability assessment of pediatric interfacility transport handover standardization. *Pediatric quality & safety*, 3(6), e118-e118. doi:10.1097/pq9.0000000000000118
- Spruce, L. (2016). Back to basics: Patient care transitions. *AORN Journal*, 104(5), 426-432. doi:https://doi.org/10.1016/j.aorn.2016.08.014
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- Veldstra, J., Raingruber, B., Billings, L., Dennis, A., Ver Steeg, P., Hansen, Y., Wells, J., Allen, C., Heitmeyer, J., Olmstead, H. A., Chavez, A., Blackson, C., Koplin, H., Seaters, D. (2015). The perspectives of emergency personnel regarding ways to improve trauma patient handoffs in the resuscitation room. *J J Nurse Care*, 1(2): 007.
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CHAPTER FOUR

REFLECTION ON DNP ESSENTIALS AND EDUCATIONAL JOURNEY

Introduction

I began the full-time Doctor of Nursing Practice (DNP) at Montana State University (MSU) in 2020, following a one-year deferral due to a combat deployment with the US Navy. I had 15 years of intensive care unit (ICU) nursing at the time, with accents in emergency and flight nursing. The DNP was attractive because it focused on applying practice innovations using evidence-based research (American Association of Colleges and Nursing [AACN], 2006).

Scientific Underpinnings for Practice

The first DNP Essential demands multidisciplinary integration, strategies for improving health, and devising new ways of treating patients using theory (AACN, 2006). The MSU curriculum includes several courses to meet the first essential. Nursing 601 health assessment, Nursing 602 pathophysiology, Nursing 606 statistics, Nursing 607 diagnostic reasoning, Nursing 612 ethics, Nursing 619 skills and procedures, and Nursing 603 and 620 pharmacology all contribute to the scientific underpinnings for practice as a DNP.

The most applicable exemplar for the first essential is the clinical courses themselves (Nursing 621, 622, 623, and 624). Making decisions and seeing the effects on a living human being as described by the AACN are contained within the myriad of patient documentation I have written over the last four semesters.

Organizational and Systems Leadership for Quality Improvement

The second DNP Essential endorses that the sustainment of positive change only occurs when organizational, professional, and financial support structures are in alignment (AACN, 2006). Nursing 608 and 613 focused on the principles of business, finance, economics, and health policy can begin with 5S concepts. These concepts imbue quality in a system, and collaborative problem-solving should start by asking the 5-Whys to generate a fishbone diagram and build a root cause analysis. I will encourage a culture that follows a plan, do, check, act cycle and use this tool to communicate the organizational priorities when resolving issues, for example, via an A3 Report.

In terms of design, I have learned simple tools to address these factors in supply management via spaghetti diagrams in reducing wasted transit time, Kanban in ensuring the right supplies are available, and keeping inventories at appropriate levels. In addition, I have learned how billing practices and Centers for Medicare & Medicaid Services (CMS) reimbursement drive the accurate analysis of financial statements, balance sheets, and breakeven analyses in terms of finance.

Clinical Scholarship and Analytical Methods for Evidence-Based Practice

Gaining familiarity and experience in applying the AGREE II tool to clinical practice guidelines has equipped me with the possibility of determining which studies are best for implementation. The evidence-based practice of Nursing 604 and 605 taught me how to critically appraising scholarly resources, empowering me to choose what is evidence-based or not for the most significant impact. Implementing those findings deemed worthy of practice will take more

time and exposure with guided mentorship. This coursework highlighted the importance of using studies less than three years old unless considered seminal work. Consideration of using quality instruments, controlling for confounding variables, and appreciating bias will be a lifelong professional pursuit.

MSU taught me the importance of mentorship from knowledgeable and experienced nurse practitioners, nurse leaders, and educators. Mentorship will allow me to design and implement processes to evaluate practices against benchmarks to determine variances. Variances may be a red flag, but they may also be a time to determine why a procedure is done in the status quo and provoke possible improvement. Evidence-based practice directly challenges the statement of “doing things the way they have always been done.” Progress starts with questioning. A good starting point is formulating a solid population, intervention, control, and outcomes (PICO) question, as my included group project exemplar demonstrated.

Finally, I understand how close examination of study limitations, gaps discovered in the literature review, and recommendations for future research propel practice implementations. I have learned to regard the peer-review process and be cognizant of predatory journals. My next step is to analyze and communicate these concepts within professional circles.

Information Systems/Technology and Patient Care
Technology for the Improvement and Transformation of Health Care

I provide the learning opportunities gained from Nursing 610, healthcare informatics to address Essential IV. My four-part informatics technology project exemplifies the design, selection, use, and evaluation of a system that evaluates and monitors outcomes of care, care systems, and quality improvement. A cost transparency tool is my example of consumer use of

healthcare information to avoid unexpected out-of-pocket expenses, economical healthcare choices, and increased patient satisfaction. Bringing the cost of billable healthcare services to the forefront in an accessible transparency tool reduces stress and provokes a shared decision-making model.

In analyzing critical elements necessary to selecting, using, and evaluating patient care technology, telehealth is the most crucial contribution informatics will make in my professional career. Telehealth is safe, appropriate, and effective in rural areas, where patients may not access traditional healthcare. I have been in remote healthcare situations with the US Navy before and look forward to engaging in similar civilian opportunities. As technology and global bandwidth improve, I anticipate better remote healthcare will be positioned at the spear's tip. Such tools will not replace the nurse but rather enhance the nurse. Affording a mobile collaborative approach will create a "one-stop shop" anywhere. I see this contributing to a sum greater than its parts and expediting care since consultations could be accomplished synchronously with the primary visit.

As demonstrated in my exemplar, I employed API technology for data extraction from practice information systems and databases. The results generated cost information from billable healthcare services in my informatics technology project. In addition, my understanding of API technology demonstrates my proficiency in the conceptual ability and technical skills to develop and execute such a plan.

My learning of ethical and legal issues within healthcare relating to information, communication networks, and patient care technology grew in a collegial discussion about the links between healthcare system reimbursement and incentives from CMS. Moreover, in contrast, the HITECH Act's penalties to healthcare systems that did not comply with EHR

adoption. I now grasp that CMS tracks quality measures as a metric for reimbursement and a healthcare consumer appraisal tool. Despite the praise that CMS may receive, as a flight nurse, I understand that our company is reimbursed the least by patients with Medicare insurance. Furthermore, future CMS proposals for further reimbursement reduce payments even more. Regardless of the mixed findings on CMS, reimbursement, and quality, informatics is the way forward. As a future leader in healthcare, I must remember that frontline information from nurses should help guide policymakers.

Health Care Policy for Advocacy in Health Care

For Essential V, I critically analyzed a health policy issue that has long been critical in critical care: the mismatched expectations of end-of-life care among providers, nurses, patients, and support members. Nursing 612, ethics, law, and policy as well as Nursing 614 provoked thoughts on advanced care planning that is not universally described in contrast to physicians' orders for life-sustaining treatment documents. In response to hundreds of cases of inappropriate heroics, national initiatives have worked to improve life-sustaining rankings but not advanced care planning. Without advanced care planning, I propose an ethical policy to advocate for the patient broadly.

First, I have written a letter to our state representative to influence and educate others. Moral distress can be felt by a patient's support members when goal-aligned care is ambiguous after the patient cannot participate in treatment decisions— withholding and withdrawing care cause the same moral distress for support members of loved ones. Prolonged use of devices that simultaneously prolong life and cause suffering also contributes to pain. Grief, guilt, and ambiguous goal-aligned care potentially result in support members revoking end-of-life

documents during a touch-and-go environment. The health problem is the need for a universal advanced care plan that is mandatory for all adults.

The PDSA process will efficiently develop and implement my proposed advanced care planning policy. The methods provoke evaluation during small test phases, allowing swift feedback on improvements as that information becomes available. The first available metric will likely be a reduction in conflicting resuscitation order sets. Second, I will persuade the nursing community to generate valid and reliable moral distress instruments to measure the suspected drop in patient support members' distress when universal advanced care planning is in place. Removing doubt and questioning from support members' decision burden avoids their moral distress. Most importantly, a guiding document states the care options desired when hours and minutes count and maintain patient autonomy.

Interprofessional Collaboration for Improving Patient and Population Health Outcomes

AACN (2006) described the sixth essential as skills in communication, collaboration, interprofessional implementation, and a teams-approach. To meet Essential VI, Nursing 608, 609, 610, and 611 aided my assigned team implemented a metabolic screening tool to identify at-risk individuals taking psychoactive medications and apply it to primary care. The metabolic screening tool is well established in the mental health world. Implementation is low cost and adds a little work burden. The last change is an electronic health record update, followed by best-practice guidelines for treating metabolic syndrome. Metabolic syndrome is a deadly sequela that can be effectively treated.

While developing my team's quality improvement project outline, three roles I fell into and subsequently held throughout the project were information seeker, collaborator, and

orienteer. These three roles are related: seeking information looks for task clarification, collaboration provides information, and orienteering gives course corrections to keep heading for the goal.

First, our metabolic screening tool's data collection allows us to treat at-risk individuals. Second, testing for change offers preliminary data to suggest whether said treatment is an evidence-based practice. Third, as the information seeker, clarifying the imposed improvements of metabolic syndrome sequelae was the primary objective. Third, I collaborated with my team members and sought their talents, previous knowledge, and experiences to contribute to the primary purpose. Finally, orienting a team remotely avoided missing roles and pleurisy to achieve the primary objective.

Team leadership empowers leaders to observe and provoke action in followers. Team leadership was not our project team's deliberate choice. Instead, it was a necessary choice. Team experience combined with technology-based communication makes solid virtual teams geographically dispersed. Our team was no exception.

Employment of the causal loop diagram increased the communication solubility of our project team's improvement plan. Additionally, we planned to use a run chart to represent the reduction of metabolic syndrome sequelae identified by the screening tool, which is our improvement aim. Given the circular nature of screening for metabolic syndrome, treating it, and screening for a suspected reduction, the causal loop makes logical sense. Similarly, the run chart rapidly takes what I initially speculated as preliminary data to demonstrate improvement as a selling point for continued screening and spreading knowledge.

Clinical Prevention and Population Health for Improving the Nation's Health

Understanding the pressures of social determinants of health and using strategies to equalize disparities across multi-domains is the point of Essential VII (AACN, 2006). My pathophysiology case study exemplar for Nursing 602, pays particular attention to the features of psychosocial dimensions and cultural diversity. This case study followed the evolution of a traumatic brain injury in an Afghan National Army soldier. This evolution is a rough amalgamation of personal experiences as a US Navy nurse on a combat deployment. Without distracting from neurological science, I infused aspects of how the subject's nationality and religion may impart care changes, expectations, and follow-up differently from Western nursing goals.

Second, one fellow student contributed to the ongoing discussion, which provoked a scholarly sidebar conversation about the influences of lifestyle on traumatic brain injuries, especially strokes. Looking at the subject through a psychosocial and cultural lens and considering lifestyle equips me to make better interventional decisions and identify gaps in the care of individuals, aggregates, or populations.

My colleagues contributed to my case study's discussion with some of the more esoteric considerations related to community, environmental, occupational, and socioeconomic dimensions. For example, to normalize intracranial hypertension, providing a low-stimulating milieu may be challenged if the subject is a child whose parents feel compelled to interact with them. Navigating this situation with sensitivity is an area where I can grow. Another colleague raised the question of intracranial hypertension in an infant with fontanelles, a problem not

precisely addressed in this course of study; however, synthesizing knowledge on the pathophysiological mechanism led to an educated treatment strategy.

A challenge for me is understanding the unique features of nursing outside of the military and, notably, in the United States frontier regions. My goal is to continue coursework in the frontier regions of the United States and collaborate with my peers who function in critical access hospitals, community health centers, and others with experience in occupational and environmental health.

Advanced Nursing Practice

The eighth and final DNP Essentials houses the core competency of the practice-focused, doctor-prepared graduate nurse as a provider (AACN, 2006). All of the MSU's DNP curriculum courses contribute; however, the Nursing 601 and 607 assessment courses, Nursing 619 skills, procedures, Nursing 602 pathophysiology, Nursing 603 and 620 pharmacology, Nursing 607 diagnostics, and the accumulative effect of all advanced clinical systems specifically meet the advanced nursing practice essential. My exemplar for this essential is the nebulous references to the total of my peer reviews I gave and received in the Advanced Assessment course and feedback on my patient care notes.

References

American Association of Colleges of Nursing. (2006). *The essentials of doctoral education for advanced nursing practice*. The Association.

REFERENCES CITED

- Alfes, C. M., Steiner, S. L., & Manacci, C. F. (2015). Critical care transport training: New strides in simulating the austere environment. *Air medical journal.*, 34(4), 186-187. doi:10.1016/j.amj.2015.03.006
- Clark, D. (2011). Rapid emergency admission to destination initiative (READi)—Improving documentation, clinical handover and patient transfer times from emergency department to inpatient beds. *Australasian emergency nursing journal : AENJ.*, 14, S8-S9. doi:10.1016/j.aenj.2011.09.024
- Cohen, M. D., & Hilligoss, P. B. (2010). The published literature on handoffs in hospitals: deficiencies identified in an extensive review. *Quality & safety in health care.*, 19(6), 493-497. doi:10.1136/qshc.2009.033480
- Cram, N., McLeod, S., Lewell, M., & Davis, M. (2017). A prospective evaluation of the availability and utility of the ambulance call record in the emergency department. *Canadian journal of emergency medicine*, 19(2), 81-87. doi:10.1017/cem.2016.362
- Goldberg, S. A., Porat, A., Strother, C. G., Lim, N. Q., Wijeratne, H. R. S., Sanchez, G., & Munjal, K. G. (2017). Quantitative analysis of the content of EMS handoff of critically ill and injured patients to the emergency department. *Prehospital emergency care.*, 21(1), 14-17. doi:10.1080/10903127.2016.1194930
- Harmesen, A. M. K., Giannakopoulos, G., Franschman, G., Christiaans, H., & Bloemers, F. (2017). Limitations in prehospital communication between trauma helicopter, ambulance services, and dispatch centers. *The Journal of emergency medicine.*, 52(4), 504-512. doi:10.1016/j.jemermed.2016.11.010
- Lyng, J. W., Braithwaite, S., Abraham, H., Brent, C. M., Meurer, D. A., Torres, A., . . . Larrimore, A. (2021). Appropriate air medical services utilization and recommendations for integration of air medical services resources into the EMS system of care: A joint position statement and resource document of NAEMSP, ACEP, and AMPA. *Prehospital emergency care.*, 25(6), 854-873. doi:10.1080/10903127.2021.1967534
- Maddry, J. K., Simon, E. M., Reeves, L. K., Mora, A. G., Clemons, M. A., Shults, N. M., . . . Walrath, B. D. (2021). Impact of a standardized patient handoff tool on communication between emergency medical services personnel and emergency department staff. *Prehospital emergency care*, 25(4), 530-538. doi:10.1080/10903127.2020.1808745

- Makkink, A. W., Stein, C. O. A., & Bruijns, S. R. (2022). The prehospital to emergency department hand over model (PEDHOM): a conceptual model addressing content, process, and communication in prehospital to emergency department handover, 14 April 2022, PREPRINT (Version 2) available at Research Square [https://doi.org/10.21203/rs.3.rs-1418631/v2]
- Maris, M., Berben, S. A. A., Verhoef, W., van Grunsven, P., & Tan, E. C. T. H. (2022). The quality of pre-announcement communication and the accuracy of estimated arrival time in critically ill patients, a prospective observational study. *BMC emergency medicine.*, 22(1), 1. doi:10.1186/s12873-022-00601-z
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ*, 339(7716), 332-336. doi:10.1136/bmj.b2535
- Müller, M., Jürgens, J., Redaelli, M., Klingberg, K., Hautz, W. E., & Stock, S. (2018). Impact of the communication and patient handoff tool SBAR on patient safety: a systematic review. *BMJ open*, 8(8), e022202.
- Reimer, A. P., Alfes, C. M., Rowe, A. S., & Rodriguez-Fox, B. M. (2018). Emergency patient handoffs: Identifying essential elements and developing an evidence-based training Tool. *The Journal of continuing education in nursing.*, 49(1), 34-41. doi:10.3928/00220124-20180102-08
- Scott, L. A., Brice, J. H., Baker, C. C., & Shen, P. (2003). Analysis of paramedic verbal reports to physicians in the emergency department trauma room. *Prehospital emergency care.*, 7(2), 247-251. doi:10.1080/10903120390936888
- Sochet, A. A., Ryan, K. S., Miller, W., Bartlett, J. L., Nakagawa, T. A., & Bingham, L. (2018). A longitudinal and sustainability assessment of pediatric interfacility transport handover standardization. *Pediatric quality & safety*, 3(6), e118-e118. doi:10.1097/pq9.000000000000118
- Spruce, L. (2016). Back to basics: Patient care transitions. *AORN Journal*, 104(5), 426-432. doi:https://doi.org/10.1016/j.aorn.2016.08.014
- Turkelson, C., Keiser, M., Sculli, G., & Capoccia, D. (2020). Checklist design and implementation: critical considerations to improve patient safety for low-frequency, high-risk patient events. *BMJ simulation & technology enhanced learning*, 6(3), 148-157. doi:10.1136/bmjstel-2018-000353

- Veldstra, J., Raingruber, B., Billings, L., Dennis, A., Ver Steeg, P., Hansen, Y., Wells, J., Allen, C., Heitmeyer, J., Olmstead, H. A., Chavez, A., Blackson, C., Koplun, H., Seaters, D. (2015). The perspectives of emergency personnel regarding ways to improve trauma patient handoffs in the resuscitation room. *J J Nurse Care*, 1(2): 007.
- Wilson, D., Kochar, A., Whyte-Lewis, A., Whyte, H., & Lee, K.-S. (2017). Evaluation of situation, background, assessment, recommendation tool during neonatal and pediatric interfacility transport. *Air Medical Journal*, 36(4), 182-187. doi:10.1016/j.amj.2017.02