The I-PASS mnemonic and the occurrence of handoff related errors in adult acute care hospitals: a systematic review protocol

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Review question: What is the effectiveness of the I-PASS mnemonic in reducing handoff related errors during inter- or intrahospital transfers for hospitalized patients?

The objective of this systematic review is to identify the impact of the I-PASS mnemonic during hospitalized patient inter- or intrahospital transfers on medication errors, transfer delays, treatment delays and mortality. More specifically, the objective is to identify the effect that the I-PASS mnemonic has on handoff related errors during inter or intrahospital patient transfers by comparing rates pre and post I-PASS implementation.

Keywords Errors; handoff; mnemonics; acute care; handover


Introduction

Handoff related errors are one of the leading causes of adverse events in hospitals.1 According to the Joint Commission, ineffective handoff communication leads to approximately 80% of serious medical errors and is the cause of two out of every three sentinel events.2 Sentinel events are serious, sometimes fatal, preventable adverse events that occur within a healthcare setting.1 A patient handoff occurs any time one healthcare provider transfers the care of a patient to another provider. Some countries, such as those in Europe, refer to this interaction as a “handover”.3 Frequent handoffs or handovers provide increased opportunities for handoff related errors to occur, which could lead to many more sentinel events.4

In 1998, the Institute of Medicine published the report To Err is Human, which highlighted preventable deaths in healthcare settings caused by medical errors. The report prompted the United States (US) federal government to require healthcare facilities to reduce errors. The federal government suggested that organizations use principles from High Reliability Organizations (HROs), or organizations that consistently have high quality healthcare outcomes, to decrease medical errors.4 Many HROs use mnemonics when performing patient handoffs to standardize handoffs and reduce errors. Although the Joint Commission does not give specific data regarding handoff related errors, they do cite “communication errors”, including handoff errors as a contributing cause of two out of every three sentinel events in hospitals.2 The I-PASS mnemonic is one option that can be used, and a few studies have indicated that a decrease in handoff related errors has occurred in many hospitals after I-PASS implementation.4,5

The mnemonic stands for Illness severity, Patient summary, Action list, Situation awareness and contingency planning, and Synthesis by the receiver. The mnemonic began after the Accreditation Council for Graduate Medical Education (ACGME) began requiring all resident training facilities to teach resident doctors handoff skills and monitor the quality of patient handoffs.6 Many resident training facilities were lacking effective handoff curricula and methods of ensuring that trainees were acquiring the needed skills to perform patient handoffs.6 In an effort to develop a more thorough approach to performing and monitoring patient handoff performance, the I-PASS system was
The I-PASS mnemonic is not the only mnemonic that can be used for patient handoffs. The I-PASS mnemonic was chosen for evaluation in this systematic review for several reasons. The mnemonic allows for a specific summary of the patient’s history, current diagnosis and comorbidities. Unlike other mnemonics, the I-PASS mnemonic also consists of a synthesis by the receiver, which encourages the report receiver to ask questions about the patient’s assessment and treatment plans. This also allows the handoff receiver to share his or her thoughts with the report giver, which promotes joint thinking that could lead to more effective care.

Studies using the I-PASS handoff system have indicated a decrease in handoff related errors. Sheth, et al. found that transfer delays were decreased from 167 minutes to 21 minutes after the I-PASS mnemonic was implemented for patients being transferred from a cardiovascular intensive care unit to an acute care unit. Starmer, et al. showed that the use of I-PASS decreased the total error occurrence rates in nine hospitals, from 1349 occurrences before the I-PASS implementation to 981 occurrences after implementation. The occurrence of preventable adverse events within these nine facilities decreased from 261 during the pre-intervention phase to 173 after I-PASS was implemented. The number of near misses or non-harmful errors also decreased from 1088 to 808, and medication errors decreased from 660 to 580. Overall, Starmer, et al. found that using I-PASS led to a 23% percent reduction in the rate of all medical errors and a 30% reduction in the rate of preventable adverse events. Medication errors decreased from 660 pre-implementation to 580 after implementation, and incorrect or delayed diagnoses decreased from 184 to 111.

Currently, there are published systematic reviews that focus on handoff related errors and ways to prevent them, but none of these studies focus on I-PASS specifically. Robertson et al. published a systematic review in 2013 evaluating the effectiveness of interventions that aimed at improving handoff related errors. However, the studies included in this review did not include the use of the I-PASS mnemonic. The researchers who performed this study did find that no intervention, including the use of any form of a mnemonic, reliably improved handoff communication or decreased handoff related error rates. Riesenber et al. also published a systematic review of literature related to 24 different handoff mnemonics, and although they indicated that using a mnemonic may be effective in decreasing hand-off related errors, there were no outcomes measured to determine if the use of a mnemonic was actually successful in decreasing handoff related errors. They also did not discuss the I-PASS mnemonic within their study.

The purpose of this systematic review therefore is to compile evidence to inform practice change. Handoff related error rates involving medication errors, treatment delays, transfer delays or mortality will be compared with the use of I-PASS versus the use of other mnemonics, the use of no mnemonics, and before and after I-PASS implementation. The population being studied will include both adult and...
pediatric patients located within an acute care hospital setting.

A preliminary search of the JBI Database of Systematic Reviews and Implementation Reports, the Cochrane Database of Systematic Reviews, PROSPERO, DARE, Campbell Library, CINAHL and MEDLINE revealed that there were currently no systematic reviews (neither published nor in progress) on the I-PASS handoff mnemonic and its effect on handoff related error rates. Handoff related errors are delaying patient care and leading to serious complications, even to the point of patient deaths. Many studies have shown that I-PASS has been successful in decreasing handoff related errors. However, a systematic review has not yet been performed; so a systematic review would be helpful in comparing studies and determining if the use of I-PASS could benefit acute care hospital settings.

Inclusion criteria

Participants
This review will consider studies that include acute care hospitalized adult and pediatric patients of any age who have been hospitalized for any reason involved in inter- or intrahospital transfers. It will also consider studies that include healthcare providers. Healthcare providers may include but are not limited to: attending physicians, resident physicians, medical students, registered nurses, and student nurses who are involved in patient transfers. These transfers may occur both interhospital when a patient transfers from one hospital or facility to another, or intrahospital which occurs when patients transfer to a different unit or area within the same hospital.

Intervention
This review will consider studies that utilize the I-PASS process during inter- and intrahospital patient transfers.

Comparator
This review will consider studies that compare the intervention to studies that utilize other handoff mnemonics such as SBAR, PACE or SOAP, or studies that do not use a handoff mnemonic.

Outcomes
This review will consider studies that include the following outcome measures: medication errors (incorrect dosages, wrong medications), transfer delays (transfer location not being communicated, incorrect destinations being given, or treatments necessary for transfer not being performed in a timely manner), treatment delays (treatment preparations not being delivered, lab work not being collected on time, etc.), and mortality associated with handoff related errors. The error rates within these studies will be compared to pre-intervention rates, as well as rates in studies where the I-PASS handoff mnemonic is not utilized. Rates of these events will be measured by documentation in the patient’s electronic or paper medical record or hospital error reports.

Types of studies
This review will consider both experimental and quasi-experimental study designs including randomized controlled trials, non-randomized experimental studies. In addition, analytical observational studies including prospective and retrospective cohort studies, case-control studies and analytical cross-sectional studies will be considered for inclusion.

Methods
Search strategy
The search strategy aims to find both published and unpublished studies. A three-step search strategy will be utilized in this review. An initial limited search of MEDLINE and CINAHL will be undertaken followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe the article. A second search using all identified keywords and index terms will then be undertaken across all included databases. Thirdly, the reference list of all identified reports and articles will be searched for additional studies. A proposed search strategy of all the below database is included in Appendix I. Studies published from 2010 to present will be considered for inclusion in this review, as the I-PASS mnemonic was developed in 2010.

Information sources
The databases to be searched include: CINAHL, Scopus, PubMed, Embase
The search for unpublished studies will include: IPasshandoffstudy.com, MedNar, ProQuest Dissertations and Theses.
**Study selection**

Following the search, all identified citations will be collated and uploaded into Endnote (Clarivate Analytics, PA, USA) and duplicates removed. Titles and abstracts will then be screened by two independent reviewers for assessment against the inclusion criteria for the review. Studies that meet the inclusion criteria will be retrieved in full and their details imported into the Joanna Briggs Institute System for the Unified Management, Assessment and Review of Information (JBI SUMARI). The full text of selected citations will be retrieved and assessed in detail against the inclusion criteria by two independent reviewers. Full text studies that do not meet the inclusion criteria will be excluded and reasons for exclusion will be provided in an appendix in the final systematic review report. Included studies will undergo a process of critical appraisal. The results of the search will be reported in full in the final report and presented in a PRISMA flow diagram. Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer.

**Assessment of methodological quality**

Selected studies will be critically appraised by two independent reviewers at the study level for methodological quality using standardized critical appraisal instruments from the Joanna Briggs Institute for experimental and quasi-experimental studies. Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer. The results of critical appraisal will be reported in narrative form and in a table.

**Data extraction**

Data will be extracted from papers included in the review using the appropriate standardized data extraction tool available in JBI SUMARI by two independent reviewers. The data extracted will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives. Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer. Authors of papers will be contacted to request missing or additional data where required.

**Data synthesis**

Papers will, where possible, be pooled in statistical meta-analysis using JBI SUMARI. Effect sizes will be expressed as either odds ratios (for dichotomous data) and weighted (or standardized) mean differences (for continuous data) and their 95% confidence intervals will be calculated for analysis. Heterogeneity will be assessed statistically using the standard chi-squared and I² tests. The choice of model (random or fixed effects) and method for meta-analysis will be based on the guidance by Tufanaru et al. Subgroup analyses will be conducted where there is sufficient data to investigate patient age, patient gender, and type of hospital unit. Sensitivity analyses will be conducted to test decisions made regarding the implementation of the I-PASS mnemonic on medication errors, transfer and treatment delays. Where statistical pooling is not possible the findings will be presented in narrative form including tables and figures to aid in data presentation where appropriate.

A funnel plot will be generated within JBI SUMARI to assess publication bias if there are 10 or more studies included in a meta-analysis. Statistical tests for funnel plot asymmetry (Egger test, Begg test, Harbord test) will be performed where appropriate.

**Assessing confidence**

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach for assessing confidence in the quality of evidence will be used for this review, with the results presented in a summary of findings table created using GRADEPro.

**References**


Appendix I: Search strategy

**PubMed**
1. “Medication error” OR “sentinel event” OR adverse event” OR “treatment delay” OR “transfer delay” OR “procedural error” OR “healthcare error” OR “patient outcome” OR “error” OR
2. Intervention OR “mnemonic” OR “IPASS” [MeSH] OR “handover tool” OR “handoff mnemonic” OR “handoff” OR “handoff tool”
3. #1 AND #2 AND #3

**CINAHL**
1. “medical errors” OR “adverse event” OR “health care errors” OR “medication error” OR “treatment delay” OR “transfer delay” OR “sentinel event”
2. (MH “Intervention) OR (“MH “mnemonic”) OR (MH “IPASS”) OR (MH handover tool) OR (MH “handoff mnemonic”) OR (MH handoff) OR (MH handoff tool)
3. #1 AND #2 AND #3

**ProQuest Dissertations and Theses Sciences and Engineering Collection, and MedNar**
1. “Patient safety” OR “medical errors” OR “adverse event” OR “health care errors” OR “medication error” OR “treatment delay” OR “transfer delay” OR “sentinel event”
2. Intervention OR “mnemonic” OR “IPASS” OR “handover tool” OR “handoff mnemonic” OR “handoff” OR “handoff tool”
3. #1 AND #2 AND #3

**Embase**
1. ‘medical error’/exp OR ‘adverse event’ OR ‘health care errors’/de OR ‘medication error’ OR ‘treatment delay’ OR ‘transfer delay’ OR ‘sentinel event’
2. ‘intervention’/de OR ‘mnemonic’/exp OR ‘IPASS’/exp OR ‘handover tool’/de OR ‘handoff mnemonic’/exp OR ‘handoff’ OR ‘handoff tool’
3. #1 AND #2 AND #3

**Google Scholar**
1. “Patient safety” OR “medical errors” OR “adverse event” OR “health care errors” OR “medication error” OR “treatment delay” OR “transfer delay” OR “sentinel event”
2. Intervention OR “mnemonic” OR “IPASS” OR “handover tool” OR “handoff mnemonic” OR “handoff” OR “handoff tool”
3. #1 OR #2 OR #3

**IPasshandoffstudy.com**
1. “IPASS”
2. IPASS Materials