In Search of Common Ground in Handoff Documentation in an Intensive Care Unit

Sarah A. Collins, RN, PhD\textsuperscript{1}; Lena Mamykina, PhD\textsuperscript{2}; Desmond Jordan, MD\textsuperscript{2,3}; Dan M. Stein, MD, PhD\textsuperscript{2}; Alisabeth Shine MA\textsuperscript{2}; Paul Reyfman, BS\textsuperscript{2}; David Kaufman, PhD\textsuperscript{2}

\textsuperscript{1}Partners Healthcare Systems
\textsuperscript{2}Columbia University, New York, NY
\textsuperscript{3}New York Presbyterian Hospital, New York, NY
Introduction

• Handoff
  – Frequent
  – Multiple points for potential communication break-down
  – Multiple disciplines

• Purpose of the handoff
  – To establish common ground
    • Conversations
    • Shared handoff documentation tools


Problem

• Handoff in critical care
  – Intra-disciplinary process…but…critical information flow spans
    • Multiple disciplines and handoff documentation tools/artifacts (Benham-Hutchins, 2010)
  – Information complexity increases potential for communication breakdown and errors

• Proposed solutions within literature
  • Standardization
    – Unclear definition for handoff
  • Computer-based tools to support collaborative work
    – Should embed functionalities and infrastructure of paper they replaced (Xiao, 2005)
    – Standards based
Aim

• To understand the structure, functionality, and content of nurses’ and physicians’ ICU handoff artifacts to inform development of standards-based EHR handoff tools
Interdisciplinary Handoff Information Coding (IHIC) framework

• IHIC coding framework
  – Systematic Review of 36 nurse and physician handoff studies
  – 95 handoff information elements categorized in lists:
    • Interdisciplinary (46%)
    • Nursing (36%)
    • Physician (18%)
  – Continuity of Care Document (CCD) standard
    • Covered 80% of elements
    • Remaining 20% - we developed “Hospital Handoff” Sections

# IHIC Code Examples

<table>
<thead>
<tr>
<th>CCD Section</th>
<th>Nurse only data</th>
<th>Physician only data</th>
<th>Interdisciplinary data</th>
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<tbody>
<tr>
<td>Functional</td>
<td>• Neurological status</td>
<td>• Physical exam findings</td>
<td>• Patient's condition</td>
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<tr>
<td>Status</td>
<td>• Cardiovascular status</td>
<td>• Baseline status</td>
<td>• Plan of care treatment</td>
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<td></td>
<td>• Respiratory status</td>
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<td>• Specialty specific key physiologic parameters (e.g.,</td>
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<td></td>
<td>• Gastrointestinal status</td>
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<td>critical care measurements, sepsis</td>
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<td></td>
<td>• Skin integrity</td>
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<td>status, APACHE risk scale)</td>
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<td></td>
<td>• Activities of Daily Living</td>
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Methods

• Setting
  – 21 bed Cardiothoracic Intensive Care Unit (CTICU)
  – Large urban medical center
  – Used EHR for clinical documentation, not for handoff

• Data Collection
  – Observations
  – Handoff artifacts used by nurses, resident physicians and physician assistants’ (PAs)
    • Purposive sampling – maximize variability by patient type/clinical status

• Data Analysis - two-steps
    • Structure and function
  – Semantic coding using IHIC
    • Inter-coder reliability with physician informatician (30% of artifacts)
Results

• Observed a total of 9 changes of shifts

• 22 artifacts collected
  – 6 nurse admission Kardex
  – 8 nurse personal handoff sheets
  – 8 resident/PA handoff print-outs
Nurse Kardex

Nurse Kardex is an electronic logbook used to document patient care and medical information. It includes details such as the patient's name, medical history, allergies, medications, and test results. The form is designed to help nurses keep track of significant events and interventions during a patient's stay.

Events during surgery: Time spent on bypass, medications and blood products given, complications and necessary interventions.

Nurses’ admission “Kardex” used during handoff:

- Intubation; Primary nurse
- Patient’s clinical state on admission to CTICU from surgery, may include update within hours

Back of nurses’ admission “Kardex”: Updates of significant events written by each nurse at end of shift.
Nurse Personal Handoff Sheet

- Date and type of surgery
- Allergies and past medical/surgical history
- Body systems assessment: Neurological status, Respiratory status, Cardiovascular status, Gastrointestinal status, Genitourinary status, Skin integrity
- Intravenous drips: Type of medication, dose, and concentration
- Plan
- Lines and invasive devices
- Significant events: assessments, interventions, and evaluations
- Test results

CTICU specific key physiologic parameters/interventions: Pulmonary and cardiac pressure monitoring, Ventricular assist device hourly parameters

- Laboratory results
- Hourly fluid output
- Blood glucose every 2 hours, and insulin infusion adjustments

Front and back of nurse’s personal handoff sheet:
- Hospital course
- Hourly events
- Medication times
- Antibiotics
- Tasks and to-dos; Assessment of response to medication

Patient identifying information and attending physician name
Resident/PA Handoff Print-out

Bed number; Patient MRN; patient name; Date and surgical procedure(s); surgeon

Intravenous infusions

Lines and invasive devices and date of insertion

Active/Current problems/Diagnosis

Dialysis pager number

Tasks and to-dos

Significant events and dates

Resident Computer-based handoff, printed and annotated during handoff and throughout shift
Results: Artifact Structure and Functionality

• Highly structured
  – Predefined structure and “norms” for organizing data

• Functionality
  – Consistent use for nurses and residents/PAs
    • Main cognitive adjuncts
    • Discarded after shift
    • Used to copy data into EHR
  – Summarization significant events
  – Highlighted temporal information
Artifact Content – IHIC coding

- 827 data elements on 22 artifacts
  - 52 unique IHIC codes
  - 92% (757/827) elements were interdisciplinary
  - Inter-coder reliability 83%

- Nurse Kardexes
  - 309 elements => 301 interdisciplinary and 8 nursing

- Nurse personal sheets
  - 261 elements => 204 interdisciplinary and 57 nursing

- Resident/PA print-outs
  - 257 elements => 252 interdisciplinary and 5 physician
Interdisciplinary Elements consistently Present in Physician and Nurse Artifacts

- Antibiotics
- Intravenous infusions
- Lines and invasive devices
- Significant events during last shift/overnight
- Specialty specific key physiologic parameters/interventions
- Clinicians involved in case
- Hospital course/summary/current history

- Past medical/surgical history
- Patient age
- Patient name
- Patient's hospital MRN
- Plan
- Reason for admission/transfer
- Tasks/To-dos
- Test/procedure results
Mapping to CCD

• CCD sections
  – 70% (573/827) elements

• Hospital Handoff sections developed for IHIC framework
  – 30%(254/827) elements
    • Admission demographics
    • Hospital course
    • Past medical/surgical history
    • Consultations
    • Fluid Balance
    • Education
    • Updates
    • Anticoagulation status
Discussion

• Paper-based handoff artifacts
  – Non-technical, yet sophisticated and structured system
    • Physical location of data was important
  – High degree of interdisciplinary content
    • IHIC coding confirmed mapping to discipline specific lists

• Coordinate work beyond “tasks”
  • Annotations => critical thinking (Gurman, 1998; MacKay, 1999)
  • Nurses circled and annotated electrolyte and blood glucose values
    1. Acknowledgment of the critical value
    2. Unambiguous statement = medication given for that particular critical value
    3. Captured the temporal nuances of patient data
  • e.g. Potassium over-dosing errors
Discussion

• Handoff and interdisciplinary communication highly variable (Dayton, 2007)
  – Common paper structures may be leveraged to better ensure continuity of care and coordination

• Computer-based tools
  – **Further** organize and coordinate work beyond paper-based system
  – Structured narrative
  – Patient-centered
  – Role of paper-printouts and mobile devices
Limitations

• 1 setting – CTICU
• Further work is needed to determine the generalizability
Conclusions

• Management of handoff content
  – Leveraged for patient-centered care
  – Customized for specialty settings
  – Structured narrative (Johnson, 2008)
  – Transitions of care standards from other settings

• Ongoing work
  – Validate IHIC coding in other settings
    • Multidisciplinary rounds
  – Mapping to HL7vMR
Follow-up study: Multidisciplinary Rounds

Standards-Based Observational Tool

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<td>Time elapsed</td>
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| Clinicians | Shapiro 8 | | |

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<td>Tasks/to-dos</td>
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<td>Pending results and pre-op procedures</td>
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Acknowledgements

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Questions?

sacollins@partners.org