Unpacking the Complexity of Patient Handoffs Through the Lens of Cognitive Load Theory

Reference:

Author Institutions:
1Department of Psychiatry, Hofstra North Shore-LIJ School of Medicine, Hempstead, New York, USA.
2Department of Medical Education, University Medical Center Utrecht, Utrecht, the Netherlands.
3Department of Medicine, University of California, San Francisco, San Francisco, California, USA.

Tags
Clinical domain
Medical Expert
Communicator
Collaborator
Leader

Educational domain
Curriculum

(Post)graduate (Residency training)

Background
Performing a handover (handoff) complex – one must simultaneously apply and integrate clinical, communication, and systems skills into a time-limited, constrained activity where mental models of each patient and their issues are shared. The task demands can easily exceed the information-processing capacity, particularly for trainees whose knowledge, clinical problem solving and communications skills are still developing. Best practices include structured communication protocols, handoff training using multimodal methods (such as we discussed in KeyLIME 22 addressing learner, environment and systems issues.

Memory is divided into sensory memory (unlimited but short duration and not conscious), long term memory (limitless capacity and duration, needing a route map to retrieve) and working memory (packages info to store in LTM, finite- holds 4-7 ± 2 info units, processes 2-4 elements concurrently, lasts seconds). Cognitive Load theory (CLT) identifies three types of cognitive load that consume limited WM Resources (the sum of these 3):
1. Intrinsic load—associated with (intrinsic) to task to make sense of info.
2. Extraneous load—not essential (extrinsic) to task induced by the design of the task (e.g., how information is presented) or the environment (e.g., background noise).

3. Germane load—imposed by the learner’s use of cognitive strategies to reorganize information in order to refine existing schemata and enhance storage in LTM.

WM can handle more information elements when it is distributed between auditory and visual information, and when it is automatized using schemata (e.g. illness scripts)

**Purpose**

To summarize CLT, use it to identify and categorize factors that affect cognitive load and learning and performance during a handoff, then explore implications of the analysis for future handoff research and instructional design.

**Type of paper**

‘Observation’ paper, theory building

**Key Points on the Methods**

The authors generated a list of factors affecting trainee’s learning and performance of a handoff, based on CLT. The list was revised based on feedback from experts in medical education and in handoffs. By consensus, each factor was associated with the type of cognitive load it primarily affects. The authors used this analysis to build a conceptual model of handoffs through the lens of CLT.

**Key Outcomes**

Concept map of a patient handoff through the lens of cognitive load theory.

<table>
<thead>
<tr>
<th>Intrinsic</th>
<th>Extraneous</th>
<th>Germane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of information elements</td>
<td>Number of patients</td>
<td>Number of comorbidities per patient</td>
</tr>
<tr>
<td>Number of follow-up tasks</td>
<td>Rapid communication and decision-making</td>
<td>Uncertainties or contingencies:</td>
</tr>
<tr>
<td>Interactivity of the information elements</td>
<td>Interactions: disease–disease, drug–drug, disease–drug</td>
<td>Maturity of the evidence base for the disease</td>
</tr>
<tr>
<td>Knowledge level of the learner</td>
<td>Familiarity with the handoff procedure</td>
<td>Maturity of learner’s relevant illness scripts</td>
</tr>
</tbody>
</table>
Information search
Sender does not identify anticipated events
Clinical information fragmented – in different places
Handoff process not clear

Modality of information
Information not distributed between visual and auditory channels

Distractions
Background noise
Interruptions
Gradients—authority, experience, specialty
Preoccupied with internal concern (e.g., how perceived by others)

Physiology
Fatigue
Working memory capacity

Germane

Strategies to enhance learning
Self-explanation
Concentration
Metacognition:
anticipatory planning, monitoring, adapting, generalizing
Interactive questioning

An interesting ‘extra’ is the concept of ‘gradients’ of experience, expertise, authority between sender and receiver adds extrinsic load.

Key Conclusions

The authors conclude handoffs are complex and WM can be a bottleneck for learning. CLT helps identify factors that impose load unrelated to the task. CLT-related instructional interventions aim at regulating cognitive load using three basic strategies: (a) reduce extraneous load, (b) manage intrinsic load, and (c) optimize germane load.

Spare Keys – other take home points for clinician educators

1. A nice combination of education theory applied to clinical practice.
2. as meded designers, we need to be more mindful of cognitive load theory...It explains many phenomena (eg "Why do the residents take so long to do that task? I can do it in a minute!")
3. TLIM is perhaps a little brother in the pantheon of meded journals but often has great pubs. Eg the Pangaro RIME paper;