



# "Integrating Dual Process Implications into Implementation of Cognitive Support Designs in the Clinical Setting"

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August 23, 2017

# Theory and Innovation in Cognitive Support for Health Care Decision-Making



VA Salt Lake City Informatics, Decision-Enhancement, and  
Analytic Sciences (IDEAS) Center

# Cyber Seminar Series

- **Session 1:** "Implicit and Explicit Cognition in Crossing the Consciousness Divide"
- **Session 2:** Today "Integrating Dual Process Implications into Implementation of Cognitive Support Designs in the Clinical Setting"
- **Session 3:** "Integrating Pattern Matching and Active Thinking Support in Information Displays for Clinicians"

Wednesday August 30, 2017 - 12:00PM ET

# Today's Articles

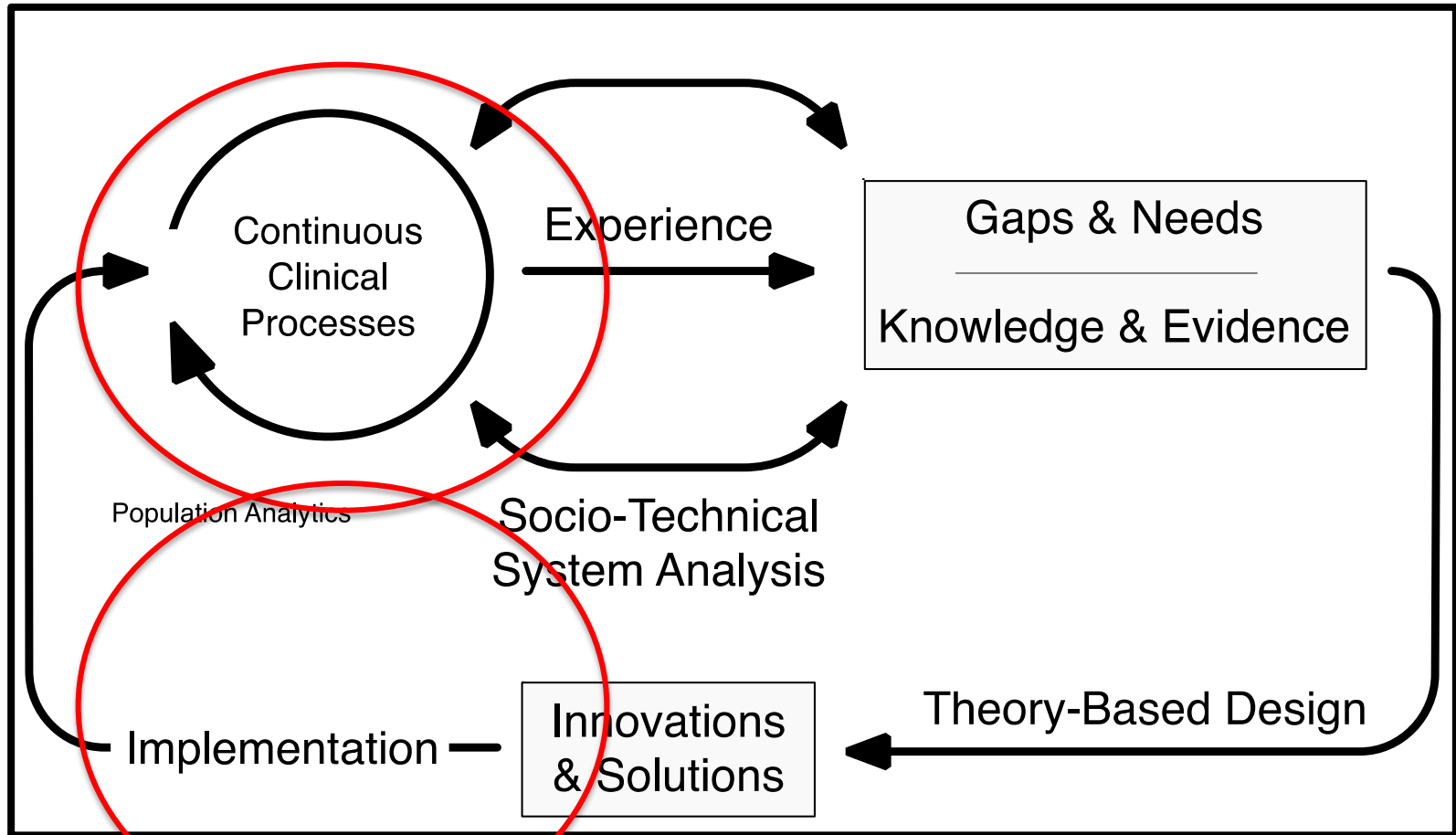
- ❑ **Making cognitive decision support work: Facilitating adoption, knowledge and behavior change through QI/ Charlene Weir, Cherie Bruncker, Jorie Butler, Mark A. Supiano**
- ❑ **Checking the lists: A systematic review of electronic checklist use in health care by: Heidi S. Kramer, Frank A Drews**

# Session 2: Bridging the Attention Gap

- ❑ These two articles are about bridging the gap between the automatic processes of System 1 and the directive efforts of System 2.
- ❑ Exploiting the human pursuit of lower cognitive load
  - ❑ Minimize attention grabbers (interrupters)
  - ❑ Maximize learning
  - ❑ Provide environmental cues



# Theory-Inspired Design



Conceptual Framework for IDEAS Research

# JBI Supplement Link

<http://www.sciencedirect.com/science/journal/15320464/71/supp/S>

# Journal of Biomedical Informatics

## Supplement Articles

1. Modeling the mind: How do we design effective decision-support? ([Editorial](#))
2. Checking the lists: A systematic review of electronic checklist use in health care ([Review](#))
3. Identifying complexity in infectious diseases inpatient settings: An observation study
4. Think twice: A cognitive perspective of an antibiotic timeout intervention to improve antibiotic use
5. Making cognitive decision support work: Facilitating adoption, knowledge and behavior change through QI
6. Detecting the presence of an indwelling urinary catheter and urinary symptoms in hospitalized patients using natural language processing
7. Veterans Like Me: Formative evaluation of a patient decision aid design
8. Physicians' perception of alternative displays of clinical research evidence for clinical decision support – A study with case vignettes
9. Translation of Contextual Control Model to chronic disease management: A paradigm to guide design of cognitive support systems
10. A pilot study of a heuristic algorithm for novel template identification from VA electronic medical record text



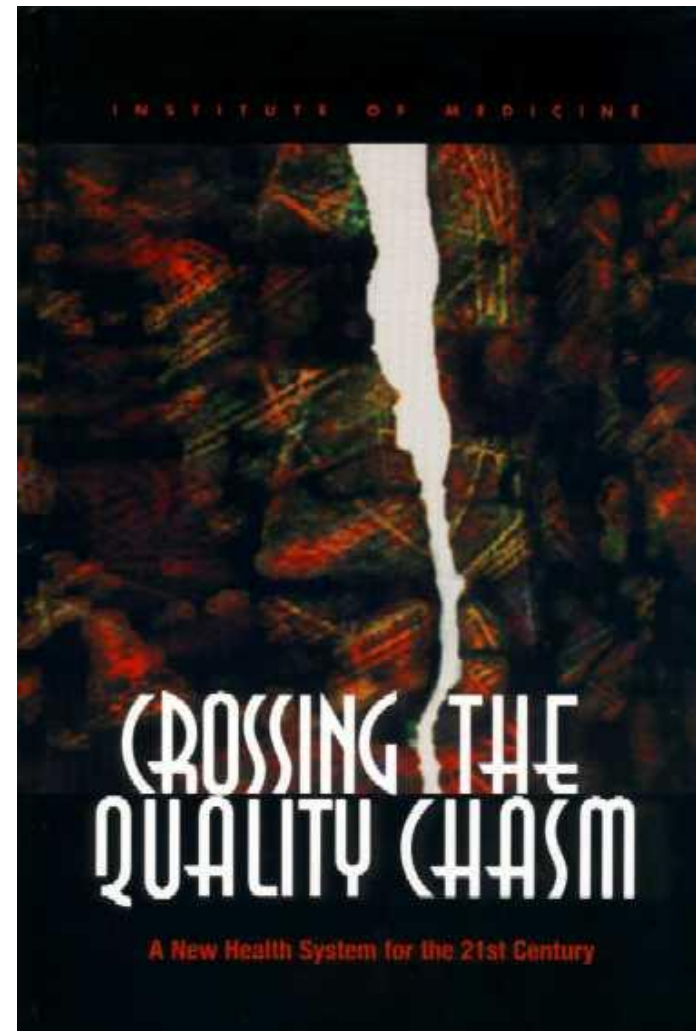


# **Part 2: "Integrating Dual Process Implications into Implementation of Cognitive Support Designs in the Clinical Setting"**

**VA SLC HSR&D Center for Innovation**

**August 23, 2017**

“Health care has safety and quality problems because it relies on outmoded systems of work. If we want safer, higher-quality care, we will need to have **redesigned systems of care** including the use of **information technology** to support clinical and administrative processes.”  
Institute of Medicine  
(2001) *Crossing the Quality Chasm* (p. 4)



# Poll Question #1

- What is your primary role in VA?
  - student, trainee, or fellow
  - clinician
  - researcher
  - Administrator, manager or policy-maker
  - Other

# **Making cognitive decision support work: Facilitating adoption, knowledge and behavior change through QI**

**Charlene Weir, Cherie Brunker, Jorie Butler, Mark A. Supiano**

# Outline for Today's Discussion

- Dual Process Regulation and Change Over Time
- What is Self-Efficacy
- QI Processes
- Aims and Objectives
- Methods
- Results
- Discussion
- Future Work

# MEMORY: *A Tale of Two Processes*

- Automatic/Heuristics/emotions, social (System 1)
- Symbolic/Active Reasoning/Requires attention (System 2)
- ***What is a memory system?***

*“... a set of acquisition, retention, and retrieval mechanisms that follows certain rules of operation” (Sherry & Schacter, 1987)*

- ***Why different systems?***
  - Consolidation of experience & memory without effort
  - Fast-learning system - good for novel, unexpected, rare data, safety issues
  - Both are active simultaneously

# Dual Process and Change Processes

- What does a CDS actually do?
- What is Self-Efficacy
- QI Processes
- Aims and Objectives
- Methods
- Results
- Discussion
- Future Work

# Need for Understanding Mechanisms

- “In summary, we identified no study or collection of studies, outside of those from a handful of HIT leaders, that would allow a reader to make a determination about the generalizable knowledge of the system’s reported benefit.”
  - Implementation processes are not reported
  - The cognitive impact of the intervention are not specified
- Facilitative processes are emerging as effective category of strategies

RAND (p. 4) Shekelle, Costs and Benefits of Health Information Technology, Southern California Evidence-based Practice Center, Santa Monica, CA, 2006. April, 2006.



# CDS Implementation, Change, and Dual Process Theories

- Implementation strategies must address BOTH systems a
- Changing practice patterns means:
  - 1) Capturing Attention
  - 2) Increasing knowledge and motivation
  - 2) Supporting capture of behavior through automatic pattern matching
  - 3) Create new habits
- ***What implementation strategy will work?***

## Poll Question #2

- Which best describes your experience in designing and implementing computerized interventions?
  - have not done any
  - have collaborated on some projects
  - have led projects myself
  - have applied for research funding in this area
  - have led a funded research grant in this area

# Quality Improvement and Facilitative Processes

## – PARiHS Framework

- **The PARiHS implementation** framework has 3 areas of focus:
  - Evidence - participants believe in the efficiency and effectiveness of the intervention
  - Context - leadership is supportive, provides direction and is integrated with the culture;
  - Facilitation - activities that support individual skills and knowledge

# Quality Improvement and Facilitative Processes

## – PARiHS Framework

- Evidence - → System 2 Attention
- Context - → System 2 Motivation
- Facilitation - → Brings control of behavior under environmental cues that again can become automatic.

# Change is BOTH a Cognitive and Behavioral Event

- It is not enough to:
  - Value something
  - Know what to do
  - Have everyone agree
  - Have enough resources
- Behavior has to be cued by the environment and mostly automatic
  - Minimizes cognitive resources
  - Continues over time

# Care of the Older Adult

- Recent reviews show significant deficits
- Assessing Care of Vulnerable Elders indicators (ACOVE) found that only 33% of vulnerable elderly received care
- Rates of appropriate care are low for geriatric-related conditions, including dementia (**11–35%**), depression (**27–41%**), and osteoporosis (**34–43%**) (Askari )
- Interventions have had minimal success

# QI Techniques and Self-Efficacy

- Self-efficacy is the individual's estimates regarding her or his ability to be successful in a task and to have the skills.
- Not the same as intentions.
- Self-efficacy perceptions predict:
  - Educational and work performance making
  - Actual outcome behavior
- QI Techniques, such as modeling, feedback and facilitation are particularly successful at enhancing self-efficacy.

# Program Description– Age QI

- A 6-month, QI, geriatric intervention implemented across 3 large health-care delivery systems.
- Clinics chose their own topic (Depression, Dementia, Falls, AD)
- Consisted of 6 components:
  - A 2 h introductory on-site didactic session /kick-off
  - A onsite QI group project planning session
  - Tailored computerized support (guidelines and alerts)
  - Tailored facilitation activities for 6 months \*\*
  - Monthly **feedback** and data analysis support
  - 20 h of CME for (AMA CME Practice Improvement)



# Measuring Self-Efficacy

- **Used Bandura's rules for assessing Self-Efficacy**
  - Focus on specific behavior, task or activity
  - Use 3 ways of asking similar question (doing, acting, behavior)
- *When making an accurate assessment of older adults for depression, I find it:*

Significantly Difficult 1 2 3 4 5 Very Easy
- *Comparatively, my skills at assessing older adults for depression are similar to my skills at assessing younger adults:*

Strongly Disagree 1 2 3 4 5 Strongly Agree
- *When deciding on treatment for depression in an older adults, I have difficulty:*

Rarely 1 2 3 4 5 Most of the Time

## RESULTS – Pre-Post Self-Efficacy

Scale	Pre-mean	Post-mean	Significance
Dementia	9.53	9.57	NS
Falls 2.68; p = 0.01		5.75	6.46 $t_{48} =$
End of life p = 0.06	11.29	12.02	$t_{48} = 1.91;$
Functional info p = 0.01	3.25	3.65	$t_{48} = 2.52;$
Depression p = 0.04	6.29	6.88	$t_{48} = 2.08;$

# RESULTS – Pre-Post Self-Efficacy

- **Participants reported greater increase in self efficacy for their own QI topics as compared to participants whose clinics did not engage in that topic.**
- Fall Prevention (10 U, 1 VA and 5 Community) = ( $t(48) = 5.42$ ;  $p = 0.001$ ) when compared to other topics
- Advanced Directives ( $n = 4$ ) = ( $t(48) = 3.18$ ;  $p = 0.042$ ) when compared to other topics.

# Setting / Participation

- 3 different healthcare systems
  - University
  - VA
  - Other Community Healthcare System
- 33 clinics (82% participation rate)
- 134 providers / 49 completed all forms and CME
- QI Projects
  - Depression
  - Falls
  - Advanced Directives
  - Dementia

# RESULTS – Pre-Post Outcomes

- All clinics had a significant and large increase in patient outcomes for screening.
- VA had an overall increase of 66%
  - Cognitive screening went from 23% to 90%
  - falls screening went from 44% to 95%
- University went from 2-3% falls screening to 46%.
- Community Health Center increased:
  - depression screening from 12-15% to 24%
  - Advanced Directives increased to 100%

# Role of Facilitation

- High Correlation of “***As a clinic, we received adequate support from the University AGE QI staff.***” with increased perceptions for:
- Proficiency at geriatric assessment ( $r(58) = 0.58$ ;  $p = 0.00$ ),
- Proficiency at caring for older adults in general ( $r(58) = 0.66$ ;  $p = 0.00$ ),
- Proficiency at implementing QI projects ( $r(58) = 0.77$ ;  $p = 0.00$ ).

# Implications and Conclusions

- An intensive QI intervention improved self-efficacy and behavior regarding care
- Facilitation strategies were associated with self-efficacy changes.
- This focus changed habitual behavior by:
  - increasing attention to the behavior,
  - providing environmental cues to control behavior, and
  - increasing skills to maximize automaticity.

# LIMITATIONS

- Facilitation was not standardized
- Sample size limited ability to do a mediation analysis
- Behavior was not individually assessed
- Geographically limited



# Checking the lists: A systematic review of electronic checklist use in health care

Heidi S Kramer PhD

University of Utah

Frank A. Drews, PhD

University of Utah

and

VA Salt Lake City Health Care System

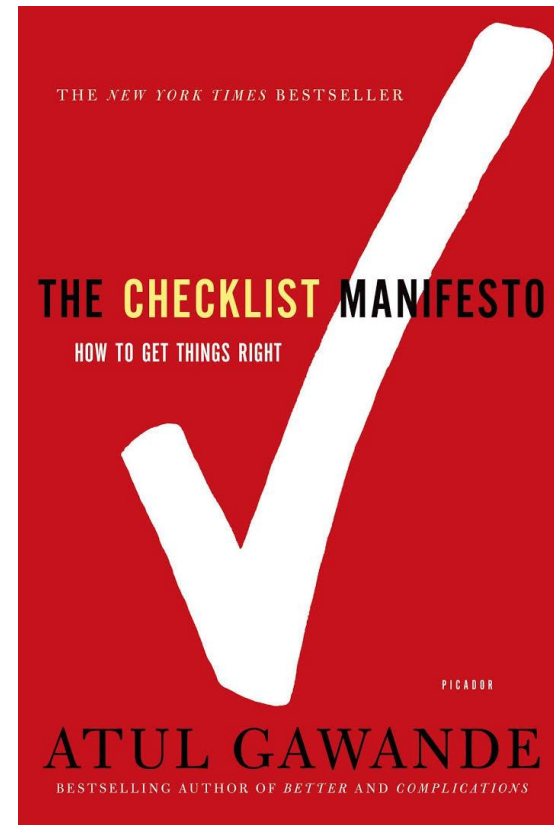
Informatics, Decision-Enhancement, and Surveillance  
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# Outline for Today's Discussion

- What is a Checklist?
- Types of Checklists
- Aims and Objectives
- Methods
- Results
- Discussion
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# Checklist Use – Aviation to Health Care



# What Checklists are Good For, and When

- Checklists act as decision aids and memory aids by:
  - Attract attention to the current task
  - Bring behavior under immediate environmental control (through cues)
  - Minimize mindless behavior and decisions
  - Checklists help move System 1 to System 2 by gaining executive control over behavior
- Checklists also:
  - Are intended to reduce cognitive load, but may actually increase cognitive load
  - Prone to be treated “mindlessly”
- Checklists can be used during: <sup>\*</sup>
  - Plan formation
  - Storage
  - Execution

<sup>\*</sup>J. Reason, Human Error, Cambridge University Press, New York, NY, 1990.

# Checklists as Decision Aids

- During plan formation checklists as decision aids can
  - Direct attention to one aspect at a time
  - Minimize the influence of cognitive biases
  - Rectify incomplete or incorrect knowledge

# Checklists as Memory Aids

- During storage and execution stages, checklists can act as memory aids to
  - Augment limited working memory capacity to track task progress
  - Augment prospective memory to perform the appropriate action at the right time

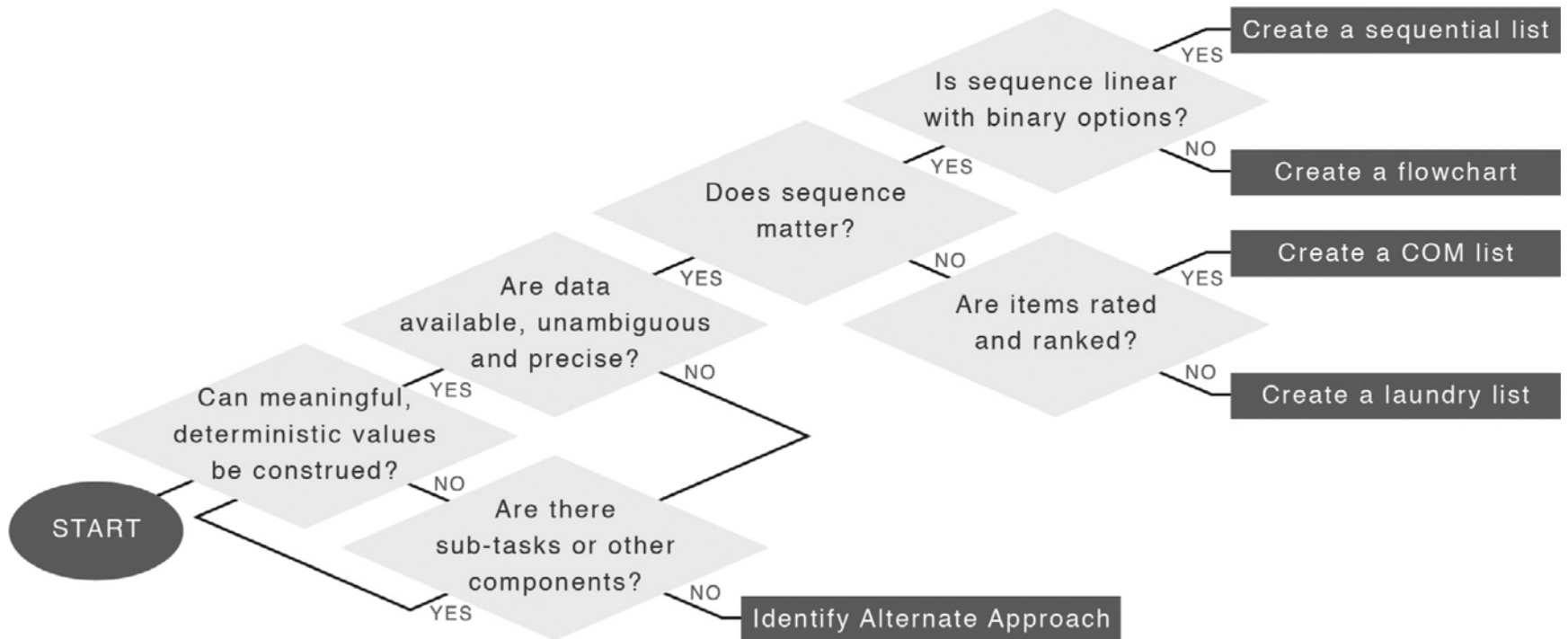
J. Reason, Human Error, Cambridge University Press, New York, NY, 1990.

# Types of Checklists

- Unstructured laundry list
  - Criteria of merit (COM) list
  - Sequential checklist
  - Flowchart/diagnostic checklist
- 
- All checklists require available, unambiguous and precise data to evaluate whether the criteria on the checklist are met

M. Scriven, The Logic and Methodology of Checklists. 2000 2007, Short Paper on the Types and Criteria for Checklists

# Flowchart Checklist for Checklist Use





## Objectives of Review

- First, to better understand the *types* of electronic checklists and *how* and *where* they are being used in healthcare
- Second, to identify the successes and failures of integrating electronic checklists into healthcare task flow and documentation
- Also a follow-up on Hales 2008 systematic checklist review \*

\* B.M. Hales et al., Development of medical checklists for improved quality of patient care, Int. J. Qual. Health Care 20 (1) (2008) 22–30.

# Methods

- Systematic literature review in MedLine using PubMed with key words *electronic* and *computerized* in conjunction with *checklist* (i.e., “*electronic checklist*,” “*computerized checklist*”
- Rationale for terms

Source	“Electronic”	“Computerized”
MEDLINE	18	5
PsycINFO	3	924

# Results

- 23 studies identified
- 8 of 23 were insufficient to assess use in health care
- 15 studies considered

# Results

- Study Designs
  - 11 pre-post implementation
  - 4 experimental designs
- Measures
  - 14 of 15 focus on changes in increased operator reliability (adherence)
  - 3 examined patient outcomes (including 1 measuring reduced readmission rates)
- Motivations
  - 7 patient safety improvement
  - 4 improve documentation
  - 3 to direct treatment interventions
  - 2 comparison to other memory aids

# Results

- Checklist types (extrapolated since types not typically specified)
  - 9 laundry list
  - 3 sequential
  - 3 unclear whether sequential or flowchart
  - 0 criteria of merit
- Benefits
  - 11 beneficial
  - 3 mixed
  - 1 no benefit

# Discussion

- Adherence as a measure of success, with limited consideration of clinical outcomes
- Checklist fatigue
- Sociotechnical perspective
- Guidelines for checklist use vs intuition

## Update on Hales et al. Study

- Checklists should follow standard methodologies for design, development and implementation
- Need for more controlled studies to assess checklist effectiveness
- Electronic checklists offer potential for improving health care

## Future Research Questions

- What are the conditions for successful implementation of e-checklists?
- What design elements are necessary to ensure adherence to the specific targeted domain without degrading performance of other tasks?
- How can checklists optimally guide the user?



## Resources

Link to full copy of Checking the Lists

<https://authors.elsevier.com/a/1VWY15SMDQR4o2>

Free access until September 27, 2017

Questions/Comments

## **Contact Information**

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