Cognitive Aids

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Cognitive aids

What is a cognitive aid?

How to evaluate a cognitive aid

What are the dangers of cognitive aids?

How to develop a cognitive aid for your team
What is a cognitive aid?

A tool that reduces load on attention and working memory

- Checklist
- Mnemonic
- Algorithm
- Decision diagram
- Flowchart
- Shelf/Organisation

Supports cognitive processes and contributes to Situation Awareness (Marshall, 2013).
Why use a cognitive aid?

- Stress
- Fatigue
- Workload
- Time pressure

COGNITIVE FUNCTION
- Judgment
- Compliance to standard procedure
- Proficiency
- Error

Healthcare teams are inherently “unstable”

(Andreatta, 2009)

- Dynamic Forming
- Limited time to prepare (prebrief)
- Shift changes
CRM: Aviation ➔ Medicine

CRM Crew (or Crisis) Resource Management

CRM model for anaesthesia includes “use cognitive aids” (Gaba, Fish & Howard, 1994)

- Supports decision making (Gaba, 2013)
- “Reader” reduces communication (Burden et al., 2012)
- Supports team co-ordination (Marshall, 2013)
Cognitive aids in medicine

WHO “safe surgery saves lives program”
**Surgical Safety Checklist** (First Edition)

**Before induction of anaesthesia**

- **Sign in**
  - Patient has confirmed
    - Identity
    - Site
    - Procedure
    - Consent
  - Site marked/not applicable
  - Anaesthesia safety check completed
  - Pulse oximeter on patient and functioning
  - Does patient have a:
    - Known allergy?
      - No
      - Yes
  - Difficult airway/aspiration risk?
    - No
    - Yes, and equipment/assistance available
  - Risk of >500ml blood loss (7ml/kg in children)?
    - No
    - Yes, and adequate intravenous access and fluids planned

**Before skin incision**

- **Time out**
  - Confirm all team members have introduced themselves by name and role
  - Surgeon, anaesthesia professional and nurse verbally confirm
    - Patient
    - Site
    - Procedure
  - Anticipated critical events
  - Surgeon reviews: what are the critical or unexpected steps, operative duration, anticipated blood loss?
  - Anaesthesia team reviews: are there any patient-specific concerns?
  - Nursing team reviews: has sterility (including indicator results) been confirmed? are there equipment issues or any concerns?
  - Has antibiotic prophylaxis been given within the last 60 minutes?
    - Yes
    - Not applicable
  - Is essential imaging displayed?
    - Yes
    - Not applicable

**Before patient leaves operating room**

- **Sign out**
  - Nurse verbally confirms with the team:
  - The name of the procedure recorded
  - That instrument, sponge and needle counts are correct (or not applicable)
  - How the specimen is labelled (including patient name)
  - Whether there are any equipment problems to be addressed
  - Surgeon, anaesthesia professional and nurse review the key concerns for recovery and management of this patient

*To fit local practice are encouraged.*
Increased safety attitudes

ERROR MANAGEMENT

Changes in safety attitude and relationship to decreased postoperative morbidity and mortality following implementation of a checklist-based surgical safety intervention


A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population

Cognitive aids in medicine

Central Line infections checklist

Baseline... median infection rate = 2.7 (per 1,000 catheter days)

- Hand Hygiene
- Prep site with antiseptic
- Use full-barrier precautions (cap, gloves, gown, mask, drape)
- Use subclavian vein where possible (not jugular or femoral site)
- Remove unnecessary catheters

3 months later... median infection rate = 0
Why people don’t use cognitive aids

- Perceived as “more paperwork” (Gawande, 2007)
- “Don’t have time” (Gawande, 2007)
- “Cheat sheet”
- Clinical and educational culture (Marshall, 2013)
Cognitive aids in medicine

WHO Surgical Safety Checklist

20% of doctors said it’s a “waste of time” but...
94% would want it used if they were the patient
Cognitive aids in medicine

Displaying cognitive aids during emergencies
✓ Reduces omissions
✓ Reduces time to perform tasks
✓ Improves team skills
✓ Improves team communication
✓ Improves team performance

Except where there are flaws in education, or physical design
Cognitive aids in medicine

Because design really does matter!
ILCOR

Flowchart:
- **Birth**
  - Term gestation? Breathing or crying? Good tone?
    - **No**
      - Warm, open airway, dry, stimulate
    - **Yes**
      - Stay with mother

- Labored breathing or persistent cyanosis?
  - **Yes**
    - SpO₂ monitoring
    - Consider CPAP
    - Postresuscitation care
  - **No**
    - HR below 100/min?
      - **Yes**
        - PPV, SpO₂ monitoring
        - Consider ECG monitoring
      - **No**
        - HR below 60/min?
          - **Yes**
            - Chest compressions
            - Coordinate with PPV
          - **No**
            - HR below 60/min?
              - **Yes**
                - IV epinephrine
              - **No**

- Maintain Temperature
- 60 seconds

Routine Care
- Provide warmth
- Ensure open airway
- Dry
- Ongoing evaluation
Newborn Life Support

At all stages ask: do you need help?

1 minute

Term gestation? Breathing or crying? Good tone?
- YES: Stay with Mother
- NO: Maintain normal temperature, Ensure open airway, Stimulate

HR below 100? Gasping or apnoea?
- YES: Positive pressure ventilation, SpO₂ monitoring
- NO: NO

HR below 100?
- YES: Ensure open airway, Reduce leaks, Consider: Increase pressure & oxygen Intubation or laryngeal mask
- NO: Laboured breathing or persistent cyanosis?
  - YES: Ensure open airway, SpO₂ monitoring, Consider CPAP
  - NO: Post-resuscitation care

Targeted pre-ductal SpO₂ after birth
- 1 min 60-70%
- 2 min 65-85%
- 3 min 70-90%
- 4 min 75-90%
- 5 min 80-90%
- 10 min 85-90%

IV Adrenaline 1:10,000 solution

<table>
<thead>
<tr>
<th>Gestation (weeks)</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>23-26</td>
<td>0.1 mL</td>
</tr>
<tr>
<td>27-37</td>
<td>0.25 mL</td>
</tr>
<tr>
<td>38-43</td>
<td>0.5 mL</td>
</tr>
<tr>
<td>10-30 mcg/kg</td>
<td>(0.1-0.3 mL/kg)</td>
</tr>
</tbody>
</table>

January 2016
Neonatal Resuscitation Algorithm—2015 Update

Antenatal counseling
Team briefing and equipment check

Birth

Term gestation? Good tone? Breathing or crying?
No

Warm and maintain normal temperature, position airway, clear secretions if needed, dry, stimulate

Apnea or gasping? HR below 100/min?
No

Labored breathing or persistent cyanosis?
Yes

PPV
SpO₂ monitor
Consider ECG monitor

Yes

HR below 100/min?
No

Postresuscitation care
Team debriefing

Check chest movement
Ventilation corrective steps if needed
ETT or laryngeal mask if needed

HR below 60/min?
Yes

Intubate if not already done
Chest compressions
Coordinate with PPV
100% O₂
ECG monitor
Consider emergency UVC

HR below 60/min?
Yes

IV epinephrine
If HR persistently below 60/min
Consider hypovolemia
Consider pneumothorax

Infant stays with mother for routine care: warm and maintain normal temperature, position airway, clear secretions if needed, dry. Ongoing evaluation

Targeted Predicted SpO₂ After Birth

<table>
<thead>
<tr>
<th>Time</th>
<th>SpO₂ Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 min</td>
<td>60%-65%</td>
</tr>
<tr>
<td>2 min</td>
<td>65%-70%</td>
</tr>
<tr>
<td>3 min</td>
<td>70%-75%</td>
</tr>
<tr>
<td>4 min</td>
<td>75%-80%</td>
</tr>
<tr>
<td>5 min</td>
<td>80%-85%</td>
</tr>
<tr>
<td>10 min</td>
<td>85%-85%</td>
</tr>
</tbody>
</table>
Newborn Life Support

1. (Antenatal counselling)
   Team briefing and equipment check

2. Birth
   
   Dry the baby
   Maintain normal temperature
   Start the clock or note the time
   Assess (tone), breathing and heart rate

3. If gasping or not breathing:
   Open the airway
   Give 5 inflation breaths
   Consider iSO₂, ECG monitoring

4. Re-assess
   If no increase in heart rate look for chest movement

5. If chest not moving:
   Re-check head position
   Consider 2-person airway control and other airway manoeuvres
   Repeat inflation breaths
   SpO₂ monitoring, ECG monitoring
   Look for a response

6. Acceptable pre-ductal SpO₂:
   2 min: 60 %
   3 min: 70 %
   4 min: 80 %
   5 min: 85 %
   10 min: 90 %

7. If no increase in heart rate look for chest movement

8. When the chest is moving:
   If heart rate is not detectable or very slow (< 60 min⁻¹)
   Start chest compressions
   Coordinate compressions with PPV (3:1)

9. Reassess heart rate every 30 seconds
   If heart rate is not detectable or very slow (<60 min⁻¹)
   Consider venous access and drugs

Discuss with parents and debrief team

At all times
Ask: Do you need help?
NEWBORN RESUSCITATION ALGORITHM

**Term gestation?**
- Breathing?
- Good Tone?

Provide warmth
- Clear airway if necessary
- Dry and stimulate
  - (Don't dry if <30 weeks - Wrap preterm baby's torso in plastic bag)
  - Note the time

Assess breathing/crying and/or heart rate
- Gasping, apnoeic or HR <100

Start ventilating with room air (Rate: 30 - 40/min)
- Use oxygen if preterm starting at 30 - 40%
- Connect to pulse oximeter if available, avoid hyperoxia
- Ensure chest rise with each breath

Assess breathing, heart rate and sats /colour every 30 - 60 seconds
- HR <100

Ventilate with supplemental oxygen as required

Assess breathing, heart rate and sats /colour every 30-60 seconds
- HR <60

Continue ventilating with supplemental oxygen as required
- Consider intubation
- Start chest compressions with coordinated ventilation
  - (3 compressions : 1 breath)
  - Each cycle should take 2 seconds

Assess breathing, heart rate and sats /colour
- HR <60

Continue compressions and ventilation
- Give 0.1 - 0.3 ml/kg Adrenaline IV (1:10 000 dilution)
  - (1 ml/kg Adrenaline ETT (1:10 000 dilution) only if no IV access)
- May repeat Adrenaline IV after 3 - 5 min
- Correct hypovolaemia if necessary
  - (10 ml/kg NS IV over 5 - 10 min)
- Consider pneumothorax / Check glucose

**Routine Care with Mother**

**If ongoing Respiratory Distress - consider CPAP**

**Oxygen Administration**
- Use blended O₂ if available to achieve targeted pre-ductal sats (see below)
  - Alternatively:
    - Bag with no O₂ = 21%
    - Bag with O₂ = 40%
    - Bag with O₂ + Reservoir = 100%

**If chest NOT moving:**
- M - Mask seal adequate?
- O - Obstruction?
  - (Secretions/Positional)
- V - Ventilate more firmly?
- I - Intubate if needed?
- N - Nasal choanal atresia?
- G - Gastric distension?

**Normal pre-ductal sats after birth**
- (right hand or ear)
  - 1 min: > 60%
  - 2 min: > 65%
  - 3 min: > 70%
  - 4 min: > 75%
  - 5 min: > 80%
  - > 10 min: 90 - 95%

**Post Resuscitation Care**
- Maintain normothermia
  - 36.5° - 37.5°C

- Consider Induced Hypothermia where available according to protocol

- If ongoing respiratory distress - consider nasal CPAP and surfactant as required according to protocol

- Maintain sats 90 - 95%
Evaluation of CAs

Medical device design guidelines (Marshall, 2013)

1. Content as per best practice guidelines

1. Appropriate for emergency use

1. Familiar format (as per training)

1. Supports team co-ordination
# CMAT Criteria

## Domain 1: Physical characteristics

<table>
<thead>
<tr>
<th>1.01 Document size</th>
<th>Is the size of the document appropriate to the space available?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.02 Tabs and dividers</td>
<td>Are any tabs that are used clearly identified?</td>
</tr>
<tr>
<td>1.03 Font type</td>
<td>Does the font type used provide clear differentiation between characters?</td>
</tr>
<tr>
<td>1.04 Print size</td>
<td>Are the action points legible at arms’ length?</td>
</tr>
<tr>
<td>1.05 Margins</td>
<td>Can you use your thumb as a cursor to keep track of progress through the cognitive aid?</td>
</tr>
<tr>
<td>1.06 Margins</td>
<td>Are all steps aligned to left?</td>
</tr>
<tr>
<td>1.07 Contrast and color</td>
<td>Has black text on a white or yellow background been used? Alert cues may be colored</td>
</tr>
<tr>
<td>1.08 Contrast and color</td>
<td>Where color shading has been used to discriminate actions or notes, is there sufficient contrast between the text and background?</td>
</tr>
<tr>
<td>1.09 Numbering</td>
<td>Are page numbers clearly identified?</td>
</tr>
<tr>
<td>1.10 Numbering</td>
<td>Are actions consecutively numbered?</td>
</tr>
</tbody>
</table>

## Domain 2: Content

<table>
<thead>
<tr>
<th>2.01 Structure</th>
<th>Has the number of action items been minimized to take account of time available to complete the cognitive aid?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.02 Title</td>
<td>Does the cognitive aid have a title?</td>
</tr>
<tr>
<td>2.03 Title</td>
<td>Does the title fully reflect the failure condition?</td>
</tr>
<tr>
<td>2.04 Failure condition</td>
<td>Does the cognitive aid contain a description of the failure condition(s)?</td>
</tr>
<tr>
<td>2.05 Objective</td>
<td>Does the cognitive aid contain an objective?</td>
</tr>
<tr>
<td>2.06 Memory items</td>
<td>Are any memory items used listed at the beginning of the cognitive aid?</td>
</tr>
<tr>
<td>2.07 Memory items</td>
<td>Are any memory items clearly distinguished from the other action items?</td>
</tr>
<tr>
<td>2.08 Memory items</td>
<td>If used, are there six or fewer memory items?</td>
</tr>
<tr>
<td>2.09 Cautionary notes</td>
<td>Are any cautionary notes clearly discriminated?</td>
</tr>
<tr>
<td>2.10 Cautionary notes</td>
<td>Are any cautionary notes printed above the action item to which they relate?</td>
</tr>
<tr>
<td>2.11 Action items</td>
<td>Are any action items used distinguishable from the text?</td>
</tr>
<tr>
<td>2.12 Action items</td>
<td>Are the 'read' and 'do' items clearly linked?</td>
</tr>
<tr>
<td>2.13 Action items</td>
<td>Are any critical items discriminated?</td>
</tr>
<tr>
<td>2.14 Action items</td>
<td>Where appropriate, does the procedure explicitly state who is responsible for specific actions?</td>
</tr>
<tr>
<td>2.15 Explanatory notes</td>
<td>Are any explanatory notes clearly distinguished from action items?</td>
</tr>
<tr>
<td>2.16 Explanatory notes</td>
<td>Are those notes linked to the action item to which they relate?</td>
</tr>
<tr>
<td>2.17 Decision items</td>
<td>Are conditional steps clearly laid out?</td>
</tr>
<tr>
<td>2.18 Review of system status</td>
<td>Is there a review of the clinical situation provided?</td>
</tr>
<tr>
<td>2.19 Deferred items</td>
<td>Is the presence or absence of deferred items clearly identified and necessary actions described?</td>
</tr>
</tbody>
</table>

## Domain 3: Layout and format

<table>
<thead>
<tr>
<th>3.01 Cognitive aids per page</th>
<th>If the cognitive aid runs onto a second page, is it split at a logical place?</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.02 Start and finish</td>
<td>Does the cognitive aid have a clearly defined start?</td>
</tr>
<tr>
<td>3.03 Start and finish</td>
<td>Does the cognitive aid have a defined end?</td>
</tr>
<tr>
<td>3.04 Start and finish</td>
<td>Are the 'end of xxx' indications provided in every place where the cognitive aid can be completed?</td>
</tr>
<tr>
<td>3.05 Continuation pages</td>
<td>Is it clear when the cognitive aid continues on to another page?</td>
</tr>
<tr>
<td>3.06 Order</td>
<td>Does the order of the action items ensure return to a safe state at the earliest opportunity?</td>
</tr>
<tr>
<td>3.07 Cross-referencing</td>
<td>Is cross-referencing minimized?</td>
</tr>
<tr>
<td>3.08 Cross-referencing</td>
<td>Where there is cross-referencing to other material is it appropriately signposted?</td>
</tr>
<tr>
<td>3.09 Figures and tables</td>
<td>Are any figures or tables clearly linked to the cognitive aid with which they are associated?</td>
</tr>
<tr>
<td>3.10 Figures and tables</td>
<td>Are the figures legible and usable?</td>
</tr>
<tr>
<td>3.11 Abbreviations and consistency</td>
<td>Do all captions and labels used in the cognitive aid correspond exactly to the words used in the clinical environment?</td>
</tr>
<tr>
<td>3.12 Abbreviations and consistency</td>
<td>Does the cognitive aid include a statement of currency (i.e. is it in date)</td>
</tr>
<tr>
<td>3.13 Abbreviations and consistency</td>
<td>Can the cognitive aid be made site-specific?</td>
</tr>
</tbody>
</table>
## Results

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Applicable attributes</th>
<th>Score</th>
<th>CMAT adherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILCOR</td>
<td>30</td>
<td>32/60</td>
<td>53%</td>
</tr>
<tr>
<td>ANZCOR</td>
<td>31</td>
<td>28/62</td>
<td>45%</td>
</tr>
<tr>
<td>AHA</td>
<td>31</td>
<td>26/62</td>
<td>42%</td>
</tr>
<tr>
<td>ERC</td>
<td>31</td>
<td>30/62</td>
<td>48%</td>
</tr>
<tr>
<td>RCSA</td>
<td>31</td>
<td>24/62</td>
<td>39%</td>
</tr>
</tbody>
</table>

**Limitations of CMAT** → **Designed for Checklists**
NEWBORN RESUSCITATION ALGORITHM

BIRTH
- Term gestation? Breathing? Good tone?
  - Yes, stay with mother
  - Warm, open airway, dry, stimulate
- No
- HR below 100/min, gasping, or apnea?
  - Yes
  - Labored breathing or persistent cyanosis?
  - PPV, SpO₂ monitoring, Consider ECG monitoring
  - No
  - HR below 100/min?
    - Yes
    - Ensure adequate ventilation, Consider ET intubation
    - No
    - HR below 60/min?
      - Yes
      - Chest compressions Coordinate with PPV
      - No
      - HR below 60/min?
        - Yes
        - IV epinephrine

Routine Care
- Provide warmth
- Ensure open airway
- Dry
- Ongoing evaluation

GOLDEN MINUTE - 60 seconds
- HR below 100/min?
  - Yes
  - Assess breathing/crying and/or heart rate
    - Gasping, apnoeic or HR < 100
    - Start ventilating with room air (Rate: 30 - 40/min)
    - Use oxygen if preterm starting at 30 - 40%
    - Connect to pulse oximeter if available, avoid hyperoxia
    - Ensure chest rise with each breath
  - No
  - Assess breathing, heart rate and saturations every 30 - 60 seconds
    - HR < 100
    - Ventilate with supplemental oxygen as required
      - Normal pre-ductal saturates after birth (right hand or ear)
        - 1 min: > 60%
        - 2 min: > 65%
        - 3 min: > 70%
        - 4 min: > 75%
        - > 10 min: 90 - 95%
  - No
  - Assess breathing, heart rate and saturations every 30-60 seconds
    - HR < 60
    - Continue ventilating with supplemental oxygen as required
      - Consider intubation
    - Start chest compressions with co-ordinated ventilation (3 compressions: 1 breath)
      - Each cycle should take 2 seconds
    - No
    - Assess breathing, heart rate and saturations every 30-60 seconds
      - HR < 80
      - Continue compressions and ventilation
        - Give 0.1 - 0.3 ml/kg Adrenaline IV (1:10,000 dilution) (1 ml/kg Adrenaline ETT 1:10,000 dilution only if no IV access)
        - May repeat Adrenaline IV after 3 - 5 min
        - Correct hypovolaemia if necessary (10 ml/kg NS IV over 5 - 10 min)
        - Consider pneumothorax / Check glucose

If ongoing Respiratory Distress - consider CPAP
- Oxygen Administration
  - Use blended O₂ if available to achieve targeted pre-ductal sats (see below)
  - Alternatively:
    - Bag with no O₂ = 21%
    - Bag with O₂ = 40%
    - Bag with O₂ + Reservoir = 100%
- If chest NOT moving:
  - M - Mask seal adequate?
  - O - Obstruction?
    - (Secretions/Post/Inhaled)
  - V - Ventilate more firmly?
  - I - Intubate if needed?
  - N - Nasal cannula atesia?
  - G - Gastric distension?

Maintain Normothermia
- 36.5° - 37.5°C
- Maintain normothermia
- Consider induced Hypothermia where available according to protocol
- If ongoing respiratory distress - consider nasal CPAP and surfactant as required according to protocol

Post Resuscitation Care
- Maintain normothermia
- Consider Induced Hypothermia where available according to protocol
- Maintain saturates 90 - 95%
Current Neonatal Resuscitation algorithm may not necessarily be the best support tool for teams

Some examples why...

- Not resilient to “special case” resuscitations
- Use of colour not easiest to read
- Infinite loop between IV epinephrine–HR<60

The dangers of poor design


2. Confusing user interface (e.g. Defibrillators accidentally turned off) (Hoyer et al., 2008)

3. Can lead to clinical error (e.g. programming errors in infusion pumps) (Nemeth et al., 2009)

4. Inflexible systems (e.g. Incorrect medication orders) (Koppel et al, 2005)
Effective design approach

Human Factors = Resilient Systems

- design to adapt to variability
- maximise strengths, support limitations
Interaction Design Process

Interviews and Observations

Establishing requirements

Field simulations

Designing alternatives

Prototyping

Evaluating

“desktop” walk-throughs

Final product

User-centered, participatory design process
Example intervention

“we built a shelf”
<table>
<thead>
<tr>
<th>Prototype</th>
<th>Images</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version 1</td>
<td><img src="image1" alt="Image" /></td>
<td>Underwent confirming validation and support approaches. Design abandonded because of excessive weight and unstable securing mechanism.</td>
</tr>
<tr>
<td>Version 2</td>
<td><img src="image2" alt="Image" /></td>
<td>Realization of attachment approach. Design abandonded because of unstable securing mechanism and consistent bed slippage.</td>
</tr>
<tr>
<td>Version 3 and 4</td>
<td><img src="image3" alt="Image" /></td>
<td>First use of soft demolition bed (cap for dorsal stabilization head to attach monitor to patient head hold). Reduction needed to improve stability and securing mechanism.</td>
</tr>
<tr>
<td>Version 5</td>
<td><img src="image4" alt="Image" /></td>
<td>Use of gel pads to ensure fit characteristics and movement. Continuous iterations needed to improve securing mechanism.</td>
</tr>
<tr>
<td>Version 6</td>
<td><img src="image5" alt="Image" /></td>
<td>Selection of a unique bed to reduce weight and improve usability. Prototype now able to be manually inserted or manually on bed side in either sitting or lowered positions. Continuous iterations needed to improve securing mechanism.</td>
</tr>
<tr>
<td>Version 7a</td>
<td><img src="image6" alt="Image" /></td>
<td>Experimental implementation of a soft magnetic bed as a locking and unlocking mechanism. Design abandonded because of potential concerns associated with impact-sensitive bedside patient devices (e.g., DVT pumps).</td>
</tr>
<tr>
<td>Version 7b</td>
<td><img src="image7" alt="Image" /></td>
<td>Use of a unique mechanism as an electronic locking and unlocking mechanism. Design abandonded because of cost, complexity, and stability concerns of vertical bed systems.</td>
</tr>
<tr>
<td>Version 7c</td>
<td><img src="image8" alt="Image" /></td>
<td>Development and incorporation of a custom highly tygular locked locking mechanism for better attachment and improved patient support. Continuous iterations needed to improve the characteristics and use comfort.</td>
</tr>
</tbody>
</table>
| Version 8 | ![Image](image9) | System of a commercial spring-loaded locking plate mechanism and horizontal stabilizer bar for final design of two ways. Additional attachment of a radiofrequency identification system allows monitoring of the device’s location or the study tract.
“they used an iterative, rapid-prototyping design approach rather than... assuming they could come up with an ideal design... with the application of effort, skill, and logic.”
Design opportunity
Design opportunity
Slides relating to intervention have been removed.
Interaction Design Process

“Rapid Prototyping”
Constantly evolving design
Feedback at every stage

Benefits

• **User-centered**
  • Accurate
  • Accepted

• **Practical**
  • Time
  • Cost
Take home messages

1. Teams don’t function in isolation: their co-ordination is effected by their tools and environment

2. Cognitive aids are valuable, but only if they are well designed

3. Take a inter-disciplinary, user-centered design approach to cognitive aid development
hound dog flowchart

caught a rabbit?

yes -> friend of Elvis

no -> not a friend of Elvis