Checks for the Checklists

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Where it all began

APPROVED B-17F and G CHECKLIST

REvised 3-1-44

PILOT’S DUTIES IN RED
COPilot’S DUTIES IN BLACK

BEFORE STARTING
1. Pilot’s Preflight—COMPLETE
2. Form 1A—CHECKED
3. Controls and Seats—CHECKED
4. Fuel Transfer Valves & Switch—OFF
5. Intercoolers—Cold
6. Gyros—UNCAGED
7. Fuel Shut-off Switches—OPEN
8. Gear Switch—NEUTRAL
9. Cowl Flaps—OPEN Right—OPEN LEFT—Locked
10. Turbine—OFF
11. Idle cut-off—CHECKED
12. Throttles—CLOSED
13. High RPM—CHECKED
14. Autopilot—OFF
15. De-icers and Anti-icers, Wing and Prop—OFF
16. Cabin Heat—OFF
17. Generators—OFF

STARTING ENGINES
1. Fire Guard and Call Clear—LEFT Right
2. Master Switch—ON
3. Battery switches and inverters—ON & CHECKED
4. Parking Brakes—Hydraulic Check—ON—CHECKED
5. Booster Pumps—Pressure—ON & CHECKED
6. Carburetor Filters—Open
7. Fuel Quantity—Gallons per tank
8. Start Engines; bat magnets on after one revolution
9. Flight Indicator & Vacuum Pressures CHECKED
10. Radio—ON
11. Check Instruments—CHECKED
12. Crew Report
13. Radio Call & Altimeter—SET

ENGINE RUN-UP
1. Brakes—Locked
2. Trim Tabs—SET
3. Exercise Turbos and Props
4. Check Generators—CHECKED & OFF
5. Run up Engines

BEFORE TAKEOFF
1. Tailwheel—Locked
2. Gyro—Set
3. Generators—ON

AFTER TAKEOFF
1. Wheel—PILOT’S SIGNAL
2. Power Reduction
3. Cowl Flaps
4. Wheel Check—OK right—OK LEFT

BEFORE LANDING
1. Radio Call, Altimeter—SET
2. Crew Positions—OK
3. Autopilot—OFF
4. Booster Pumps—On
5. Mixture Controls—AUTO-RICH
6. Intercooler—Set
7. Carburetor Filters—Open
8. Wing De-icers—OFF
9. Landing Gear
a. Visual—Down Right—DOWN LEFT
Tailwheel Down, Antenna in, Ball Turret Checked
b. Light—OK
9. Switch Off—Neutral
10. Hydraulic Pressure—OK Valve closed
11. RPM 3100—Set
12. Turbines—Set
13. Flaps 1⁄3—1 Down

FINAL APPROACH
14. Flaps—PILOT’S SIGNAL
15. RPM 2200—PILOT’S SIGNAL
But why?

OVER 16?....CHECK.
CONDOM? ....CHECK.
BLOOD TEST? ....CHECK.
SAID "YES" IN ONE OF
THE ELEVEN OFFICIAL
LANGUAGES?

FOR GOODNESS
SAKE HENRY...
I'M YOUR
WIFE!
Comments from the non-believers
“Surely we know it all already?”
“I’m a Doctor... I don’t need a checklist”
“Using a checklist in ED just proves you guys are useless at airway management”
“Undermining and infantilising medicine”

... Large Socio-cultural change needed for routine adoption
But why?

Checklists provide a systematic protocol for both high-risk routine and emergency scenarios

“Often knowledge is not the problem, it’s the execution or lack thereof that causes problems in surgery, and checklists can help with the execution of essential tasks” Gawande.
Why Checklists?

- Arriaga NEJM Jan 2013: *Simulation-Based Trial of Surgical-Crisis Checklists*
- Failure to adhere to lifesaving processes of care:
  - 6% of steps missed when checklists were available
  - 23% when they were unavailable, $P<0.001$
  - Relative Risk Reduction of 28% after MV analysis
Standardization
Standardization

Auckland HEMS Checklist for Normal Operations

Pre-Procedural Sedation Checklist (CNO5)

Objective: Preparation for procedural sedation in an out of hospital setting

Is procedural sedation the best option?.................................................................Yes/No

Is environment optimized? (360 access, team size)............................................Check

Prepare Team

Drug provider...........................................................................................................Identified

CAUTION: Unless stated otherwise, drug provider oversees vital sign monitoring

Airway operator.......................................................................................................Identified

Procedure operator.................................................................................................Identified

Prepare Patient

Patient’s allergies reviewed and considered.........................................................Check

Airway assessment completed................................................................................Check

Patient position optimized.....................................................................................Check

Vascular access patent and secure.........................................................................Check

Monitoring (Saturation probe, 3-lead, BP, +/- capnography).................................Check
Resource Limitations
Shared Responsibility
So, now what?
Type 1: READ-DO

Auckland HEMS Emergency Medical Checklist

Local Anaesthetic Toxicity (EMC16)
Definition: Seizure or arrhythmia, in the presence of local anaesthetic application

1. Declare ‘medical emergency’.........................................................Check
2. Ventilate with 100% oxygen.........................................................Check
3. Administer Midazolam for seizures.................................................Check
4. Treat arrhythmias as per ACLS algorithms......................................Check

CAUTION: Avoid use vasopressin, CCB, BB, or further local anaesthetics

5. Notify receiving hospital of possible local anaesthetic toxicity…..Check
   a. Suggest preparation of Lipid Emulsion (20%) therapy, 1.5mL/kg

Checklist Complete
Type 2: CHALLENGE - RESPONSE

Auckland HEMS Checklist for Normal Operations

Post-Intubation Checklist (CNO2)

Objective: Initiate once endotracheal tube placement is confirmed with quantitative capnography

1. Et\textsubscript{CO}_2……………………………………………...____mmHg
2. Tube depth and security…………………………………Secure @ depth of ____cm
3. Disconnect nasal prongs……………………………Check
4. Blood pressure………………………………………mmHg
5. O\textsubscript{2} Sats…………………………………………____%…
6. Administer sedation and rocuronium……………Check
7. Reattach C-spine collar……………………………..Check/Not required
8. Portable O\textsubscript{2} Supply………………………………____PSI
    a. Consider additional O\textsubscript{2} if <1000 PSI

CAUTION: Assess for pneumothorax prior to transport

9. Lines/Tubes/Drains secure……………………………Check
10. Ventilator Set-up……………………………………Required/Not required

Checklist Complete
Type 2

Surgical Safety Checklist

Before induction of anaesthesia (with at least nurse and anaesthetist)

- Has the patient confirmed his/her identity, site, procedure, and consent?
  - Yes
  - No
  - Not applicable

- Is the site marked?
  - Yes
  - Not applicable

- Is the anaesthesia machine and medication check complete?
  - Yes
  - No
  - Not applicable

- Is the pulse oximeter on the patient and functioning?
  - Yes
  - No

- Does the patient have a:
  - Known allergy?
    - Yes
    - No
  - Difficult airway or aspiration risk?
    - Yes
    - No
  - Yes, and equipment/assistance available
  - Risk of >500ml blood loss (7ml/kg in children)?
    - Yes
    - No
    - Yes, and two IVs/central access and fluids planned

Before skin incision (with nurse, anaesthetist and surgeon)

- Confirm all team members have introduced themselves by name and role.
  - Yes
  - No
  - Not applicable

- Confirm the patient's name, procedure, and where the incision will be made.
  - Yes
  - No
  - Not applicable

- Has antibiotic prophylaxis been given within the last 60 minutes?
  - Yes
  - No
  - Not applicable

Anticipated Critical Events

To Surgeon:
- What are the critical or non-routine steps?
- How long will the case take?
- What is the anticipated blood loss?

To Anaesthetist:
- Are there any patient-specific concerns?

To Nursing Team:
- Has sterility (including indicator results) been confirmed?
- Are there equipment issues or any concerns?

Is essential imaging displayed?
- Yes
- No
- Not applicable

Before patient leaves Operating Room (with nurse, anaesthetist and surgeon)

Nurse Verbally Confirms:
- The name of the procedure
- Completion of instrument, sponge and needle counts
- Specimen labelling (read specimen labels aloud, including patient name)
- Whether there are any equipment problems to be addressed

To Surgeon, Anaesthetist and Nurse:
- What are the key concerns for recovery and management of this patient?

This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.
Modern Day Aviation

This image of a normal checklist shows the steps pilots and crew must complete in a particular situation. A touchpad-and-cursor-style system is used to navigate through the checklist. The item highlighted with a white box is the one currently being addressed by the pilot. All steps in this checklist must be completed before the system indicates "Checklist Complete" and prompts the pilot to the next checklist, reducing the potential for errors.
British CAA

Safety Regulation Group

CAP 676

Guidance on the Design, Presentation and Use of Emergency and Abnormal Checklists
Modern Day Checklists

Original Article

Cognitive Aids in Medicine Assessment Tool (CMAT): preliminary validation of a novel tool for the assessment of emergency cognitive aids*

D. Evans,1 R. McCahon,2,3 M. Barley,2 A. Norris,2,3 A. Khajuria4 and I. Moppett5

1 Airway Fellow, 2 Honorary Lecturer, 4 Medical Student, 5 Associate Professor, Anaesthesia and Critical Care Research Group, University of Nottingham, Nottingham, UK
3 Consultant, Department of Anaesthesia, Queen’s Medical Centre, Nottingham, UK

Summary
Applying human factors principles to the design of clinical emergency guidelines is important. The UK Civil Aviation Authority uses a Checklist Assessment Tool for evaluating the content and usability of emergency drills before introduction into service on aircraft. We hypothesised that this model could be used to develop a generic medical tool. A three-stage modified Delphi process was used to adapt the above tool for use in designing medical emergency guidelines. The resulting Cognitive aids in Medicine Assessment Tool was then used to score and rank seven published difficult airway guidelines; the scores were used to assess its validity and reliability. Pearson’s rank coefficient between these scores and scores from independent assessors was 0.89 (p = 0.007). Internal consistency, as assessed by Cronbach’s alpha, was 0.74, 0.96 and 0.72 for the tool’s three constituent domains of physical characteristics, content and layout/format, respectively. Inter-rater reliability, as assessed by Cohen’s kappa, ranged from 0.33 to 0.72. The adoption of our tool has the potential to improve the usability of medical emergency guidelines.
# CMAT

## The Cognitive aids in Medicine Assessment Tool (CMAT)

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<th>Attribute</th>
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<td>Are the action points legible at arms’ length?</td>
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<td>Can you use your thumb as a cursor to keep track of progress through the cognitive aid?</td>
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<td></td>
<td>1.7</td>
<td>Are all steps aligned to left?</td>
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<tr>
<td>Contrast and colour</td>
<td>1.8</td>
<td>Has black text on a white or yellow background been used? ‘Alert cues’ may be coloured</td>
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<td></td>
<td>1.9</td>
<td>Where colour shading has been used to discriminate actions or notes, is there sufficient contrast between the text and background?</td>
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<td>Are actions consecutively numbered?</td>
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## The Existing Checklist

**Auckland HEMS Checklist for normal operations**

### (CNO2) Post-Intubation Checklist

Initiate once endotracheal tube placement is confirmed with quantitative capnography

1. **EtCO₂**
   - **___ mmHg**

2. **Tube secure**
   - **Secure @ depth of ___ cm**

3. **Reattach C collar**
   - **Check/Not required**

4. **Blood pressure**
   - **___ mmHg**

5. **O₂ sats**
   - **___ %**

6. **Disconnect nasal prongs**
   - **Check**

7. **Administer sedation**
   - **Check**

8. **Administer rocuronium**
   - **Check**

9. **Assess chest for pneumothorax**
   - a. **If pneumo suspected, decompress chest**
     - **Likely/Unlikely Check**

10. **Tubes/lines/drains secure**
    - **Check**

11. **Pelvic binder**
    - **Check/Not required**

12. **Legs tied/fractures splinted**
    - **Check/Not required**

13. **Portable O₂ Supply**
    - **___ %**

14. **Attach BVM to portable O₂ tank**
    - **Check**

15. **Route to helicopter/land ambulance**
    - **___**

*Checklist complete.*
The Focus Group
The ‘New and Improved’

Auckland HEMS Checklist for Normal Operations

**Post-Intubation Checklist (CNO2)**

Objective: Initiate once endotracheal tube placement is confirmed with quantitative capnography

1. \( \text{EtCO}_2 \) ................................................................. \( \text{___mmHg} \)
2. Tube depth and security.......................................................... Secure @ depth of \( \text{___cm} \)
3. Disconnect nasal prongs......................................................... Check
4. Blood pressure................................................................. \( \text{___mmHg} \)
5. \( \text{O}_2 \) sats................................................................. \( \text{___\%} \)
6. Administer sedation and curium.................................Check
7. Reattach C-spine collar......................................................... Check/Not required
8. Portable \( \text{O}_2 \) Supply.......................................................... ____ PSI
   a. Consider additional \( \text{O}_2 \) if \( <1000 \text{ PSI} \)

CAUTION: Assess for pneumothorax prior to transport

9. Lines/Tubes/Drains secure.................................................. Check
10. Ventilator Set-up.......................................................... Required/Not required

*Checklist Complete*
Was the result better?
The 17 Participants

Study participants by profession

- Pilot: 5
- Crewperson: 2
- Paramedic: 6
- Doctor: 4

Number of participants
The Data

19%
## The Data

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<th>Undecided</th>
<th>Agree</th>
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<td>(2)</td>
<td>(3)</td>
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</tbody>
</table>
Thank you
References:


• CAA UK. CAP 676: Guidance on the Design, Presentation and Use of Emergency and Abnormal Checklists, August 2006


Abstract

Title: Improving the usability of prehospital checklists with multidisciplinary application of the Cognitive Aids in Medicine Assessment Tool (CMAT).

Authors:
Damjan Gaco, MD, Christopher J. Denny, MD, MSc, FRCPC, FACEP, FACEM, Alana Harper, MBChB, FACEM, Peter Jones, MBChB, FACEM, MSc EBHC (Oxon)

Background:
Advanced airway management in a prehospital setting is potentially hazardous. Checklists are one commonly used countermeasure. In aviation, checklists are evaluated for their usability. In health care, such evaluations of human factors are less common. Recently, a UK Civil Aviation Authority checklist assessment tool was derived and validated for clinical use.

Hypothesis:
We evaluated the performance of our current post-intubation challenge-and-response checklist against a revised post-intubation checklist. The revised checklist was developed using human factors design methodology. We then used the ‘Cognitive Aids in Medicine Assessment Tool’ (CMAT) to evaluate checklist performance. The CMAT consists of 24 questions in the domains of physical characteristics, content, layout and format. Each question is scored from 0 (no characteristics met) to 2 (all characteristics met).

Methods:
This prospective observational study involved volunteers from the flight crew of one prehospital service, including pilots, crew, paramedics and doctors. Participants reviewed, then scored both checklists using the CMAT (maximum score of 48), plus a global assessment using a five level Likert scale. We tested for differences in scores using the paired samples t-test. We tested for differences in Likert scale using a McNemar test.

Principal Findings:
Seventeen members of the flight crew participated in this study. The revised post-intubation checklist showed a mean improvement in CMAT score of 9.1 points (95% CI 7.1-11.2, p<0.001). The revised checklist was globally rated higher on the Likert Scale (p=0.003).

Discussion:
Use of the CMAT improves the usability of a prehospital post-intubation checklist by roughly twenty percent. This may increase the effectiveness of an inexpensive cognitive aid during a critical phase of care in an austere environment.