Checks for the Checklists

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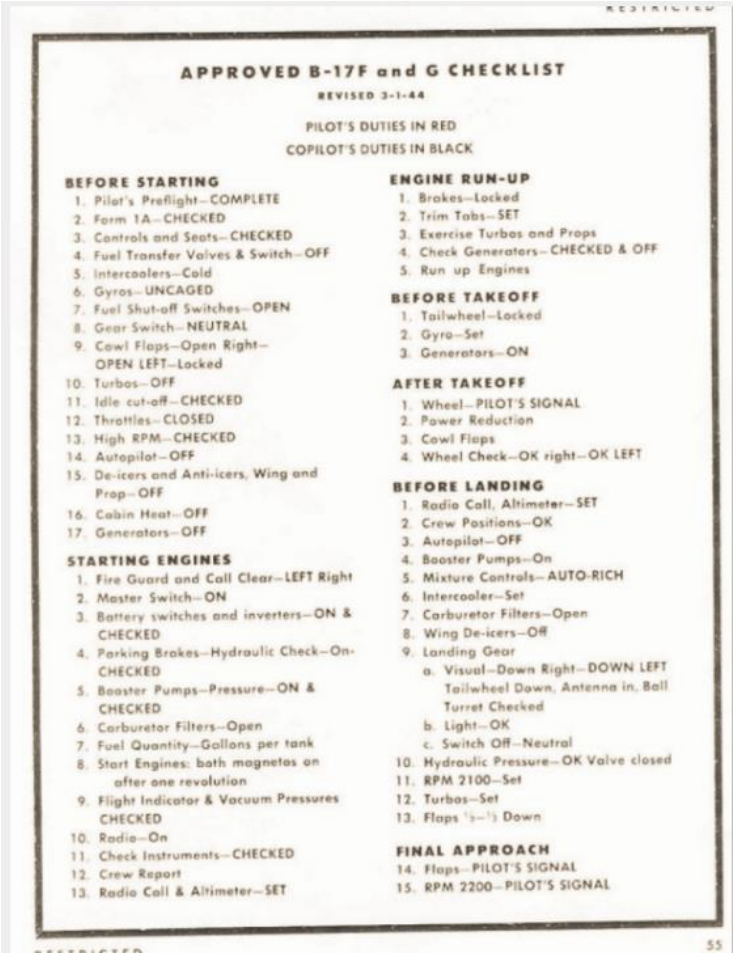
Where it all began



RESTRICTED

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. Turbos—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: both magnetos 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
   c. Switch Off—Neutral
10. Hydraulic Pressure—OK Valve closed
11. RPM 2100—Set
12. Turbos—Set
13. Flaps ⅓—⅓ Down

FINAL APPROACH
14. Flaps—PILOT'S SIGNAL
15. RPM 2200—PILOT'S SIGNAL

55

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) VApr16

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

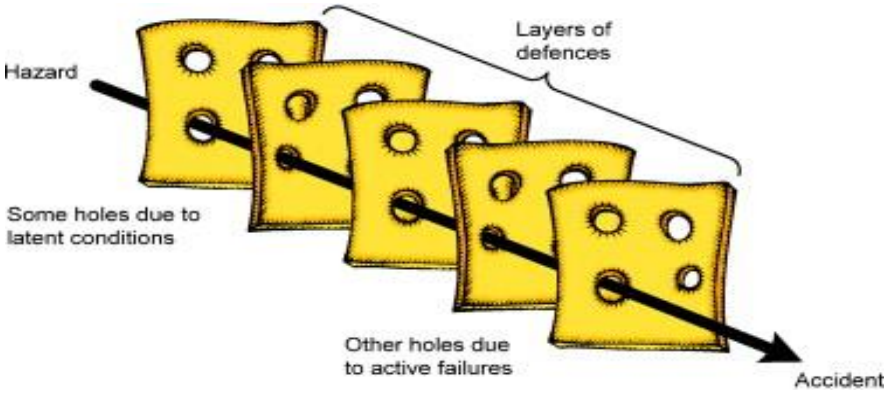
Patient's allergies reviewed and considered.....Check

Airway assessment completed.....Check

Patient position optimized.....Check

Vascular access patent and secure.....Check

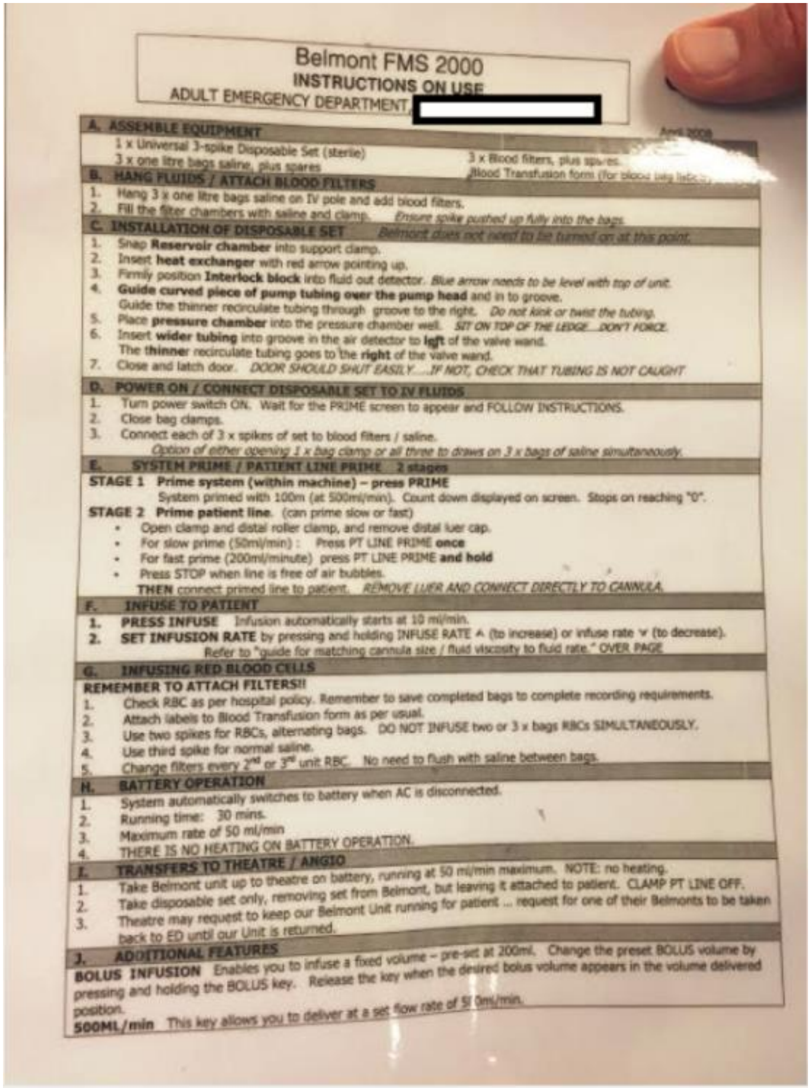
Monitoring (Saturation probe, 3-lead, BP, +/- capnography).....Check



Resource Limitations

Shared Responsibility

So, now what?



Belmont FMS 2000
INSTRUCTIONS ON USE
ADULT EMERGENCY DEPARTMENT, [redacted]

April 2008

A. ASSEMBLE EQUIPMENT

1 x Universal 3-spike Disposable Set (sterile)
3 x one litre bags saline, plus spares
3 x Blood filters, plus spares
Blood Transfusion form (for blood bag labels)

B. HANG FLUIDS / ATTACH BLOOD FILTERS

1. Hang 3 x one litre bags saline on IV pole and add blood filters.
2. Fill the filter chambers with saline and clamp. *Ensure spike pushed up fully into the bags.*

C. INSTALLATION OF DISPOSABLE SET *Belmont does not need to be turned on at this point.*

1. Snap **Reservoir chamber** into support clamp.
2. Insert **heat exchanger** with red arrow pointing up.
3. Firmly position **Interlock block** into fluid out detector. *Blue arrow needs to be level with top of unit.*
4. **Guide curved piece of pump tubing over the pump head** and in to groove. Guide the thinner recirculate tubing through groove to the right. *Do not kink or twist the tubing.*
5. Place **pressure chamber** into the pressure chamber well. *SIT ON TOP OF THE LEDGE....DON'T FORCE.*
6. Insert **wider tubing** into groove in the air detector to **left** of the valve wand. The **thinner** recirculate tubing goes to the **right** of the valve wand.
7. Close and latch door. *DOOR SHOULD SHUT EASILY.....IF NOT, CHECK THAT TUBING IS NOT CAUGHT*

D. POWER ON / CONNECT DISPOSABLE SET TO IV FLUIDS

1. Turn power switch ON. Wait for the PRIME screen to appear and FOLLOW INSTRUCTIONS.
2. Close bag clamps.
3. Connect each of 3 x spikes of set to blood filters / saline. *Option of either opening 1 x bag clamp or all three to draws on 3 x bags of saline simultaneously.*

E. SYSTEM PRIME / PATIENT LINE PRIME 2 stages

STAGE 1 Prime system (within machine) – press PRIME
System primed with 100m (at 500ml/min). Count down displayed on screen. Stops on reaching "0".

STAGE 2 Prime patient line. (can prime slow or fast)

- Open clamp and distal roller clamp, and remove distal luer cap.
- For slow prime (50ml/min) : Press PT LINE PRIME **once**
- For fast prime (200ml/minute) press PT LINE PRIME **and hold**
- Press STOP when line is free of air bubbles.

THEN connect primed line to patient. *REMOVE LUER AND CONNECT DIRECTLY TO CANNULA.*

F. INFUSE TO PATIENT

1. **PRESS INFUSE** Infusion automatically starts at 10 ml/min.
2. **SET INFUSION RATE** by pressing and holding INFUSE RATE ^ (to increase) or infuse rate v (to decrease). Refer to "guide for matching cannula size / fluid viscosity to fluid rate." OVER PAGE

G. INFUSING RED BLOOD CELLS

REMEMBER TO ATTACH FILTERS!!

1. Check RBC as per hospital policy. Remember to save completed bags to complete recording requirements.
2. Attach labels to Blood Transfusion form as per usual.
3. Use two spikes for RBCs, alternating bags. DO NOT INFUSE two or 3 x bags RBCs SIMULTANEOUSLY.
4. Use third spike for normal saline.
5. Change filters every 2nd or 3rd unit RBC. No need to flush with saline between bags.

H. BATTERY OPERATION

1. System automatically switches to battery when AC is disconnected.
2. Running time: 30 mins.
3. Maximum rate of 50 ml/min
4. THERE IS NO HEATING ON BATTERY OPERATION.

I. TRANSFERS TO THEATRE / ANGIO

1. Take Belmont unit up to theatre on battery, running at 50 ml/min maximum. NOTE: no heating.
2. Take disposable set only, removing set from Belmont, but leaving it attached to patient. CLAMP PT LINE OFF.
3. Theatre may request to keep our Belmont Unit running for patient ... request for one of their Belmonts to be taken back to ED until our Unit is returned.

J. ADDITIONAL FEATURES

BOLUS INFUSION Enables you to infuse a fixed volume – pre-set at 200ml. Change the preset BOLUS volume by pressing and holding the BOLUS key. Release the key when the desired bolus volume appears in the volume delivered position.

500ML/min This key allows you to deliver at a set flow rate of 500ml/min.

Type 1: READ-DO

Auckland HEMS Emergency Medical Checklist

Local Anaesthetic Toxicity (EMC16)

VFeb16

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) VDec15

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

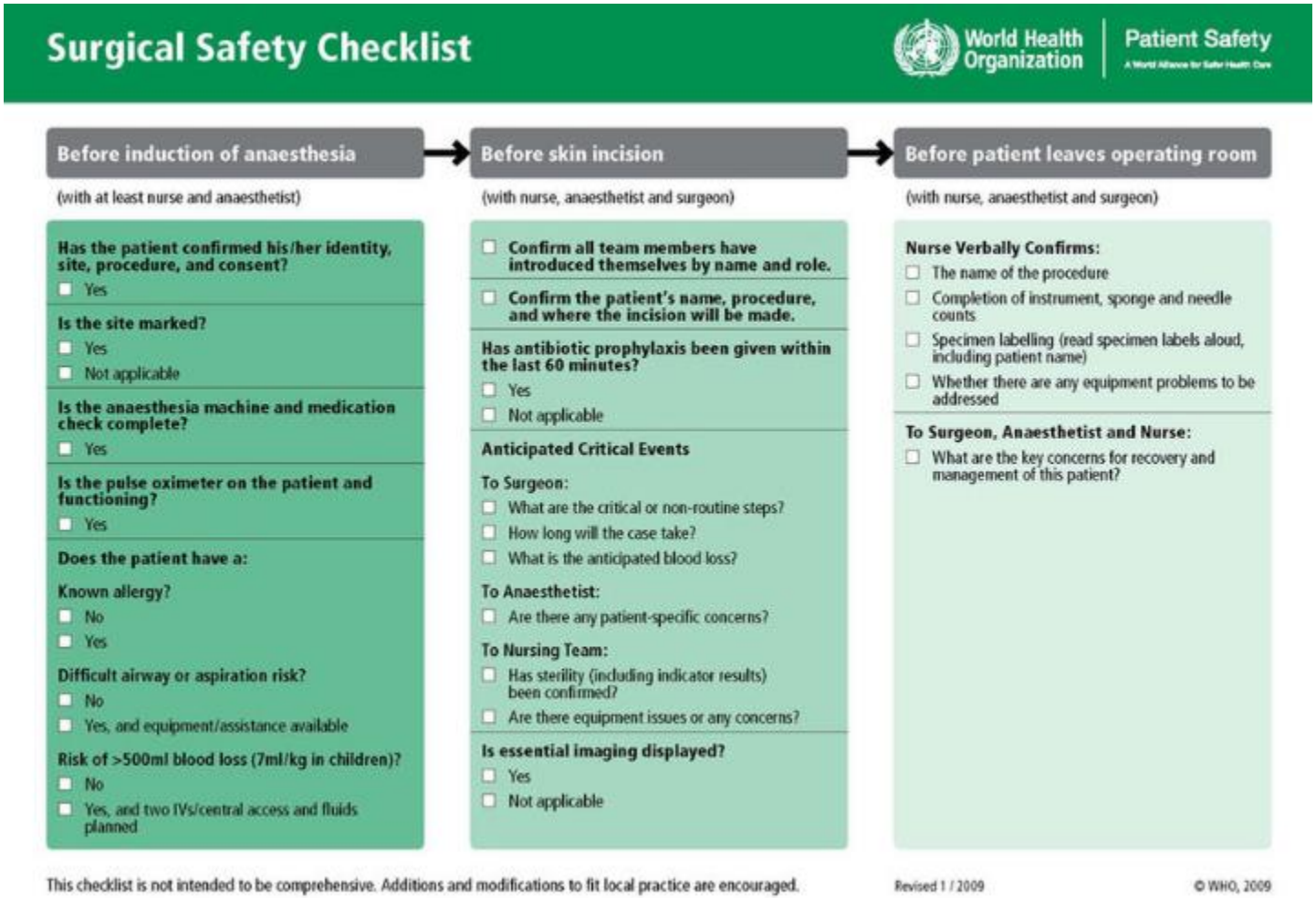
1. **$EtCO_2$……____mmHg**
2. Tube depth and security……Secure @ depth of ____cm
3. Disconnect nasal prongs……Check
4. Blood pressure……mmHg
5. O_2 sats……____%
6. Administer sedation and rocuronium……Check
7. Reattach C-spine collar……Check/Not required
8. Portable O_2 Supply……____PSI
   a. Consider additional O_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

World Health Organization | Patient Safety

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

Has the patient confirmed his/her identity, site, procedure, and consent?
- ☐ Yes

Is the site marked?
- ☐ Yes
- ☐ Not applicable

Is the anaesthesia machine and medication check complete?
- ☐ Yes

Is the pulse oximeter on the patient and functioning?
- ☐ Yes

Does the patient have a:

Known allergy?
- ☐ No
- ☐ Yes

Difficult airway or aspiration risk?
- ☐ No
- ☐ Yes, and equipment/assistance available

Risk of >500ml blood loss (7ml/kg in children)?
- ☐ 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.**
- ☐ **Confirm the patient's name, procedure, and where the incision will be made.**

Has antibiotic prophylaxis been given within the last 60 minutes?
- ☐ Yes
- ☐ 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
- ☐ 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.

Revised 1 / 2009

Modern Day Aviation

JIM ANDERSON PHOTO

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

Civil Aviation Authority

CAP 676

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

Modern Day Checklists

Anaesthesia 2015 doi:10.1111/anae.13015

Original Article

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

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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

Appendix

The Cognitive aids in Medicine Assessment Tool (CMAT)

Title	Attribute	Description	Score
Domain 1 physical characteristics			
Document size			
1.1	Is the size of the document appropriate to the space available?	The cognitive aid must be visible in an accessible location and of an appropriate size	
Tabs and dividers			
1.2	Are any tabs that are used clearly identified?	Tabs are physical attributes that allow quick identification and access at the beginning of a section/chapter. Tabs should be clearly identified in order to avoid a delay in locating the correct drills. Tab numbering should be consistent throughout the document	
Font type			
1.3	Does the font type used provide clear differentiation between characters?	Use of sans serif fonts (without tails) such as Helvetica, Gill Medium or Arial fonts are recommended as these are easier to read	
Print size			
1.5	Are the action points legible at arms' length?	The text must be legible under all lighting conditions at arm's length (approximately 600 mm)	
Margins			
1.6	Can you use your thumb as a cursor to keep track of progress through the cognitive aid?	It should be possible to hold the list using the thumb as a cursor without obscuring the text. A 19-mm margin is recommended	
1.7	Are all steps aligned to left?	If the steps run horizontally or diagonally away from the left margin it will not be possible to use thumb as a cursor.	
Contrast and colour			
1.8	Has black text on a white or yellow background been used? 'Alert cues' may be coloured	Recommend using white or yellow background. If other colours are used check legibility under low ambient lighting	
1.9	Where colour shading has been used to discriminate actions or notes, is there sufficient contrast between the text and background?	Colour shading provides a good method of discrimination but must be used with care. The use of pastel colours (low saturation) for shading is recommended.	
Numbering			
1.10	Are page numbers clearly identified?	Lack of page numbers can make the cognitive aid unusable. Recommend putting the number at the bottom or top of the page with a large font size. If the document has only a single page, then a statement similar to '1 of 1' is recommended	
1.11	Are *actions* consecutively numbered?	Numbering actions assists in place keeping. Multiple actions need to be numbered	

The Existing Checklist

Auckland HEMS Checklist for normal operations

(CNO2) Post-Intubation Checklist

Initiate once endotracheal tube placement is confirmed with quantitative capnography

1. $EtCO_2$	____mmHg
2. Tube secure	Secure @ depth of ____cm
3. Reattach C collar	Check/Not required
4. Blood pressure	____mmHg
5. O_2 sats	____%
6. Disconnect nasal prongs	Check
7. Administer sedation	Check
8. Administer rocuronium	Check
9. Assess chest for pneumothorax	Likley/Unlikely
a. If pneumo suspected, decompress chest	Check
10. Tubes/lines/drains secure	Check
11. Pelvic binder	Check/Not required
12. Legs tied/fractures splinted	Check/Not required
13. Portable O_2 Supply	____%
14. Attach BVM to portable O_2 tank	Check
15. Route to helicopter/land ambulance	____

Checklist complete.

The Focus Group

The ‘New and Improved’

auckland hems

Auckland Rescue Helicopter Trust

Auckland HEMS Checklist for Normal Operations

Post-Intubation Checklist (CNO2)

VDec15

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

1. **$EtCO_2$……____mmHg**
2. Tube depth and security……Secure @ depth of ____cm
3. Disconnect nasal prongs……Check
4. Blood pressure……mmHg
5. O_2 sats……____%
6. Administer sedation and curium……Check
7. Reattach C-spine collar……Check/Not required
8. Portable O_2 Supply……____PSI
   a. Consider additional O_2 if <1000 PSI

CAUTION: Assess for pneumothorax prior to transport

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

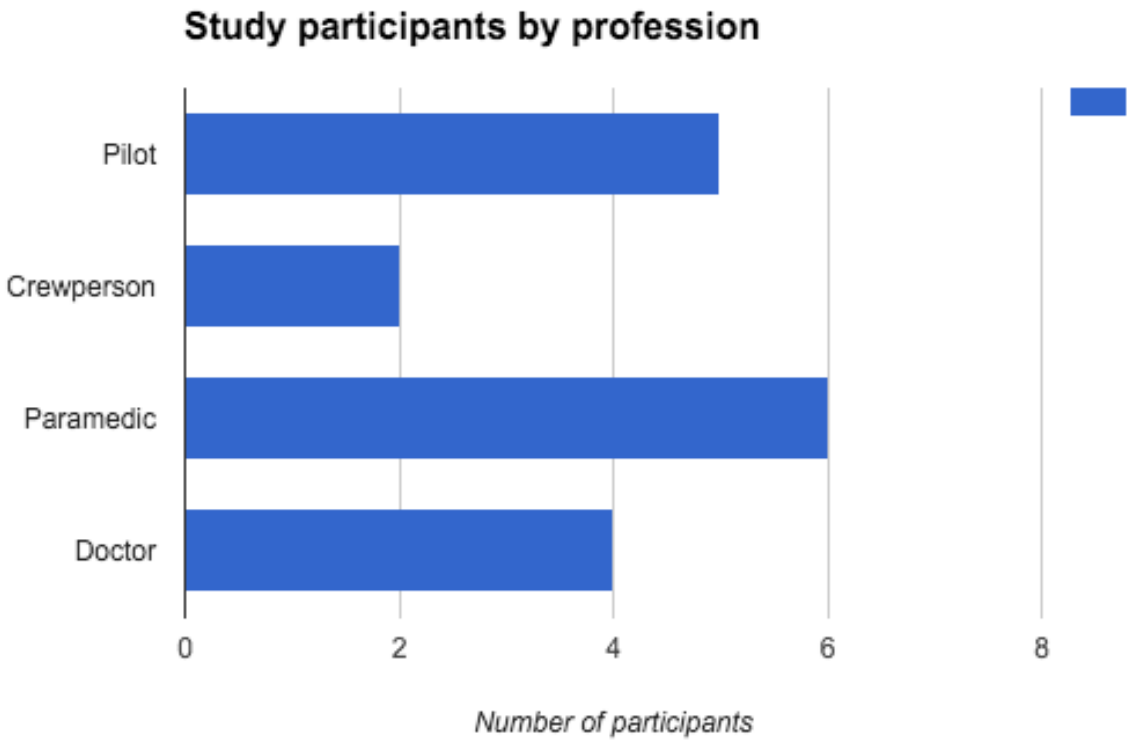
Checklist Complete

AUCKLAND DISTRICT HEALTH BOARD Te Toka Tumai

NZBLOOD Te Ratonga Toto O Aotearoa

Was the result better?

The 17 Participants



The Data

The Data

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

Thank you

References

References:

- Evans et al. Cognitive Aids in Medicine Assessment Tool (CMAT): preliminary validation of a novel tool for the assessment of emergency cognitive aids. Anaesthesia, 2105; 70: 922–932.
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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.