



TG 230 – MPPG 3: **The Development, Implementation, Use** **and Maintenance of Safety Checklists**

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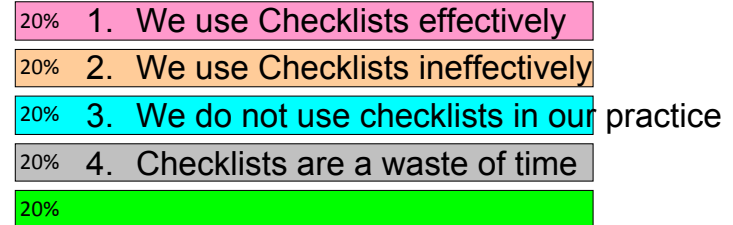
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Safety Checklist - Utilization



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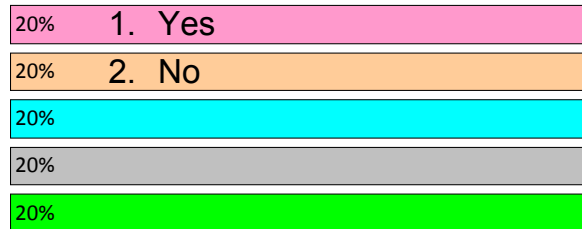
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Would our field benefit from guidelines on
 developing safety checklists?



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The Story

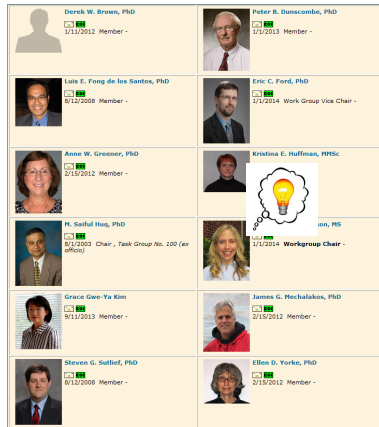
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Work Group on Prevention of Errors in Radiation Oncology



Using simple and accessible tools

How can we improve safety and quality in our field??



Checklists

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TG-230 / MPPG-3
The Development, Implementation, Use and Maintenance of Safety Checklists

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Start: 6/26/2012

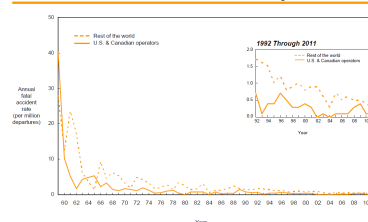
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Checklists - Background

- Checklists have been extensively validated in non-medical and medical fields for many years, and have proven to be an effective tool in error management and a key instrument in reducing the risk of costly mistakes and improving overall outcomes.

U.S. and Canadian Operators Accident Rates by Year
Fatal Accidents - Worldwide Commercial Jet Fleet - 1959 Through 2011



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Checklists - Background

- Pronovost P, *et al.* An intervention to decrease catheter-related bloodstream infections in the ICU. *New England Journal of Medicine* 2006
 - Reducing hospital-acquired infection rates by 70%.
- Haynes AB, *et al.* A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population. *New England Journal of Medicine* 2009
 - Improved compliance with standards of care by 65% and reduced surgical mortality by nearly 50%
- What about **Radiation Oncology, Diagnostic Imaging, Nuclear Medicine** and **Medical Physics**?



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Achievable Goals

- Compliance improvement of clinical protocols, procedures and processes
- Reduction of near-misses in critical clinical processes
- Enhancement of communication and team dynamic
- Improve practice standardization
- Streamline workflow

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Role of Checklists in Error Management

- Basic memory guide those tasks that are easily forgotten; allowing the team to concentrate on tasks that require full attention (Gawande 2009)
- Checklists function as a supporting interface among individuals, and between individuals and their environment (Patient Safety Primers: Checklists)

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Before skin incision
(with nurse, anesthesiologist 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
- Are antibiotic prophylaxis have been given within the last 60 minutes?
 - Yes
 - No
 - Not applicable
- Anticipated Critical Events
 - To Surgeon:
 - What are the critical or non-critical steps?
 - How long will the case take?
 - What is the anticipated blood loss?
 - To Anesthesiologist:
 - Are there any patient-specific concerns?
 - To Nursing Team:
 - Has timely triaging indicator results been confirmed?
 - Are there equipment issues or any concerns?
- Is essential imaging available?
 - Yes
 - No
 - Not applicable

UPON INITIAL ASSESSMENT

- Record respiratory rate over one full minute and oxygen saturation if possible
- If respiratory rate is high or oxygen saturation is low, alert senior care staff for action
- Record history including flu-like symptoms, date of contact with people who have flu-like symptoms, co-morbidities
- Consider specialized diagnostic tests (e.g. RT-PCR)
- Use medical/surgical mask, eye protection, gloves and respiratory samples
- Label specimen correctly and send as per local regulations, biohazard precautions
- Consider alternative or additional diagnosis
- Report suspected case to local authority

UPON ARRIVAL TO CLINICAL SETTING/TRIAGE

- Direct patient with flu-like symptoms to designated waiting area
- Provide instruction and materials to patient on respiratory hygiene/equipment etiquette
- Put medical/surgical mask on patient if available and tolerable to patient

CABIN CHECK

- Ignition Key
- Documents (AROW)
- Mobile Meter
- Control Lock
- Electrical & Autoclave
- Master Switch
- Autoclave Master Switch
- Annunciator Panel Switch
- Emergency

ON GLARESHIELD

- CHECK
- CHECK TIME
- REMOVE
- OFF
- ON/CHECK FAN/OFF
- TEST LIGHTS
- CHECK
- DOWN
- CHECK
- OFF

PRE LEAVING DESIGNATED AREA

- Remove any personal protective equipment (gloves, gown, mask, eye protection)
- Dispose of disposable items as per local protocol
- Clean hands
- Clean and disinfect dedicated patient equipment and personal items that have been in contact with patient

Rooming room

- Key into (AROW)
- Annunciator
- Lock
- Switch
- Master Switch
- Annunciator Panel Switch
- TEST LIGHTS
- UP
- Light
- Switch
- State
- ON

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Sociocultural Component of Checklists

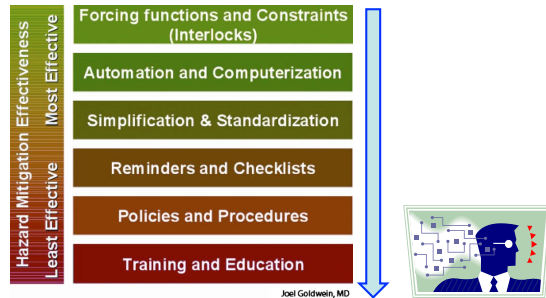
- The mistake of the “simple checklist” story is in the assumption that a technical solution (checklist) can solve and adaptive (sociocultural) problem.” (Bosk et al. 2009)

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Hazard Mitigation Effectiveness



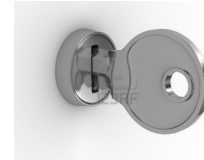
Courtesy of J. Goldwein, Elekta, AB.

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Forcing Function



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Checklist

Before induction of anaesthesia
(with at least nurse and anaesthetist)
Has the patient confirmed his/her identity, site, procedure, and consent?
<input type="checkbox"/> Yes
Is the site marked?
<input type="checkbox"/> Yes
<input type="checkbox"/> Not applicable
Is the anaesthesia machine and medication check complete?
<input type="checkbox"/> Yes
Is the pulse oximeter on the patient and functioning?
<input type="checkbox"/> Yes
Does the patient have a:
Known allergy?
<input type="checkbox"/> No
<input type="checkbox"/> Yes
Difficult airway or aspiration risk?
<input type="checkbox"/> No
<input type="checkbox"/> Yes, and equipment/assistance available
Risk of >500ml blood loss (7ml/kg in children)?
<input type="checkbox"/> No
<input type="checkbox"/> Yes, and two IV/central access and fluids planned



- Procedure
- Process
- System

- Motivation
- Perception
- Interpretation
- Discipline
- Fatigue
- Distraction
- Compliance
- Mood
- Cooperation
- Etc.

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Drill Bench

Drill Bit



+



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Checklist in Airline Industry

Checklists
+
Crew Resource Management (CRM)

CRM focuses on:
interpersonal communication,
leadership, and
decision making

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Checklist in Medical Industry

Checklists
+
Safety Culture

Factors of Safety Culture:
Commitment of upper level management to safety
Shared attitudes towards safety and hazards
Flexible norms and rules to deal with hazardous situations
Organizational learning

Pidgeon and O'Leary 2000

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The Organization and Checklists

Pronovost's - Michigan Keystone ICU experience:

- Summarizing, simplifying and standardizing the process,
- Creating internal social networks with shared sense of mission and mutual reinforcement mechanisms,
- Gathering, measuring and providing feedback on clearly defined outcomes,
- Developing and supporting a Just and Safe Culture

(Dixon-Woods et al. 2011)

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Checklists – What's Next?

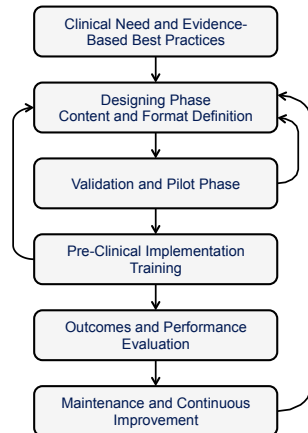
- The first step on developing checklists is to find those areas or processes with the strongest evidence and clinical impact and have the lowest barriers for implementation and utilization (Bosk et al. 2009)
- Poor selection or ambiguity on the checklist goal, role or tasks will most likely lead to failure on the checklist intervention (Gurses et al. 2008)
- The selection process should concentrate on the "killer items"

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Checklist Development and Implementation Process



TG-230 – in progress

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Simple versus Complex Environments and Processes



Single physicist practice with one linac and developing a checklist for setting water tank



- Multidisciplinary group developing a checklist for a specialized procedure
 - Examples: SBRT, SRS, Angiogram, CT Scan, etc.



- Large practice developing a checklist for pre-treatment physics plan check



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Gather the Team

- Team approach should be used throughout all the phases of development, implementation and maintenance of a specific checklist



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Human Factors Engineering (HFE)

- HFE uses knowledge about human characteristics, both capabilities and limitations that are relevant during any designing process and aims to optimize the interactions among people, machines, procedures, systems and environments
- Checklist design recommendations can be classified into three main areas:
 - Physical Characteristics
 - Content
 - Layout and Format



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Use of "pre" may look similar to "post." Before and After are less likely to be confused

Poor

PRE-INCISION

☐ CHECK BLOOD PRESSURE

☐ ALLERGIES?

☐ CHECK PULSE

☐ CHECK MEDICATION USE (IF YES, SEE CHECKLIST PAGE 6-112)

☐ VERIFY SITE, IDENTITY, PROCEDURE, CONSENT

Vague question; unknown what a check here would mean

Boxes are low contrast; far removed from the action they refer to

Lack of whitespace & use of caps decreases readability

Listed actions not clearly separated

Creates undue load on memory, both in keeping the current checklist in mind while looking at another page and in the lengthy wording: "CHECKLIST PAGE 6-112"

Improved

BEFORE INCISION

All items must be verbally verified by patient and nurse.

☐ Patient has confirmed:

- Site
- Identity
- Procedure
- Consent

☐ Site marked or not applicable

→ Allergies

☐ Yes (list)

☒ No

☐ Pulse oximeter in place and working

High contrast text

Responsibility assigned

Outcome of allergy questioning is clear; environmental support added by having allergen recorded

Raised boxes draw attention and shadow gives additional contrast

Overall flow moves from questions that need patient input and confirmation to actions that need to be confirmed by the nursing team. Whitespace and changes in font act as visual cues for flow through the checklist and completeness.

McLaughlin, A. C. (2010). What Makes a Good Checklist. In, (AHRQ) - <http://www.webmm.ahrq.gov/perspective.aspx?perspectiveID=92>

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A CHECKLIST FOR CHECKLISTS

Development → **Drafting** → **Validation**

Do you have clear, concise objectives for your checklist?

Is each item:

- ☐ A critical safety step and in great danger of being missed?
- ☐ Not adequately checked by other mechanisms?
- ☐ Actionable, with a specific response required for each item?
- ☐ Designed to be read aloud as a verbal check?
- ☐ One that can be affected by the use of a checklist?

Have you considered:

- ☐ Adding items that will improve communication among team members?
- ☐ Involving all members of the team in the checklist creation process?

Does the Checklist:

- ☐ Utilize natural breaks in workflow (pause points)?
- ☐ Use simple sentence structure and basic language?
- ☐ Have a title that reflects its objectives?
- ☐ Have a simple, uncluttered, and logical format?
- ☐ Fit on one page?
- ☐ Minimize the use of color?

Is the font:

- ☐ Sans serif?
- ☐ Upper and lower case text?
- ☐ Large enough to be read easily?
- ☐ Dark on a light background?
- ☐ Are there fewer than 10 items per pause point?
- ☐ Is the date of creation (or revision) clearly marked?

Have you:

- ☐ Tried the checklist with front line users (either in a real or simulated situation)?
- ☐ Modified the checklist in response to repeated trials?

Does the checklist:

- ☐ Fit the flow of work?
- ☐ Detect errors at a time when they can still be corrected?
- ☐ Can the checklist be completed in a reasonably brief period of time?
- ☐ Have you made plans for future review and revision of the checklist?

Atul Gawande's website Project Check (<http://www.projectcheck.org/checklist-for-checklists.html>)

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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

☐ Not applicable

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 (W) 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 / 2010 © WHO, 2009

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Operating Room Crisis Checklist - Brigham and Women's Hospital

Identification and description

3 Bradycardia – Unstable

HR < 50 bpm and symptomatic: hypotension, acutely altered mental status, shock, ischemic chest discomfort, acute heart failure

Actions

START

- Call for help and a code cart
 - Ask: "Who will be the crisis manager?"
- Turn FIO₂ to 100%
 - Verify oxygenation/ventilation
- Give atropine
 - Stop surgical stimulation (if laparoscopy, desufflate)
- If atropine ineffective
 - Start epinephrine or dopamine infusion
 - Call for expert consultation (e.g., Electrophysiologist)
 - Assessing for drug induced causes (e.g., beta blockers, calcium channel blockers, digoxin)
 - Calling for cardiology consultation if myocardial infarction suspected (e.g., ECG changes)
- Consider...
 - Turning off volatile anesthetics if patient remains unstable
 - Calling for expert consultation (e.g., Electrophysiologist)
 - Assessing for drug induced causes (e.g., beta blockers, calcium channel blockers, digoxin)
 - Calling for cardiology consultation if myocardial infarction suspected (e.g., ECG changes)

DRUG DOSES and treatments

Atropine: 1-2 mg IV, may repeat up to 3 mg total

Epinephrine: 2-10 mcg/kg IV

Dopamine: 2-10 mcg/kg IV

CHENODOL: 10 mg IV

Beta-blockers: Digoxin: 2-4 mg IV push

Calcium channel blockers: Calcium chloride: 1 g IV

Digoxin: Digoxin Immune FAS: Clinical pharmacy for patient specific dosing

CRITICAL CHANGES

1. First pacing electrode fired and back

2. Connect E3 lead ECG to the patient

3. Turn monitor/ventilator to PCV20 mode

4. Set PACER RATE: Speed to 80bpm

5. Attach leads to chest (negative area pacing is unstable)

6. Increase to 60 bpm if PACER OUTPUT with electrical capture (pacer output aligned with QRS complex)

7. Confirm effective capture

- Electrolyte assess ECG tracing
- Mechanically palpate femoral pulse (patient/pulse unstable)

CRITICAL CHANGES

FRA (wings) Scale > 10/10, 11/10

CRITICAL CHANGES

Primary: Assess and correct

Consultation: Confirm adequate IV or IO access

Consider for fluids with open

Operating Room Crisis Checklist

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TP Smart Planning Checklist

Patient Name: TEST Patient MRN: 00000000

Demographic Information:

Treatment Category: ☒ Plan ☐ Calc / TBI

Treatment Machine: 444 Modality: GK

Planning Technique: ☐ Wedges ☒ DMLC

Beam Modifiers: ☐ Bolus ☐ Blocks ☐ Spoiler

IGRT/Motion Monitoring: ☒ 2D OBI ☒ 3D OBI

Respiratory Monitoring: ☐ Gating/DIBH

Patient/Plan Specific: ☐ Pacemaker/Defib ☐ Prev Treatment ☐ Iso Shift ☒ Couch Kicks

Site: ☐ Breast w/ PAB ☐ H&N w/ LAN ☐ Thorax

Immobilization Type: ☒ Body Stereo Cradle IV

Review each item:

☒ * New TP Database has been filled in and checked over *

☒ 1. Isocenter: Confirm consistency of:
- transfer from EPID/ARL to TPS
- transfer of CT from TPS to ARL

☒ 2. Prescription: Confirm consistency of Dose per fraction and prescription isodose level between:
- Prescription
- Plan cover sheet
- MU calc sheet
- ARL

☒ 3. Transmission Factors: Considered if necessary and if so, are for correct energy
- Consider Imaging Couch factor
- Consider Body Stereo Cradle IV factor

☒ 4. ARL:
- MU's consistent between MU calc sheet and ARL
- DRR's have correct iso coordinates burned into image
- DMLC Run # consistent b/w TPS and ARL and MLC Check shows "match" for all fields
- Fields with couch kicks use "A" tolerance tables (except cranial SRS)

☒ 5. Spin/Maging: Field ID's / images are correct in SPIN

Planner: ABC Covering Planner: DEF

Necessary additional supporting documentation:
- 3D OBI Pre-Treatment QA and Shift Record

Group at Memorial Sloan-Kettering Cancer Center

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Patient ID: _____ HDR Breast Brachytherapy Record

Planning

☐ Isodose plan printed

☐ Treatment times printed

☐ Plan approved Dose/Fx on Rx: _____ Gy

☐ Plan validated Dose/Fx on Plan: _____ Gy

☐ Physics check performed Number of Fx on Rx: _____

☐ Consents verified

☐ Lengths entered Number of Fx circled below: _____

Fraction	1	2	3	4	5	6	7	8	9	10
Date:										
Time:										
Patient Survey Before Tx:										
Time Out:										
On hand: Survey Meter, Lead Container, Tong										
Two Forms of I.D										
Tx times compared with printout										
Applicator Imaging Verified by: (MD initials)										
Applicator Connected by: (initials)										
Connection Verified by: (initials)										
Backup Timer Set (Minutes & Seconds)										
Authorized User Signature										
Post Treatment										
Survey room & record										
Review Post Tx printout (sign and file)										
Dose per Fraction (Gy)										
Total Accumulated Dose (Gy)										
Operator (initials)										
Authorized Medical Physicist (initials)										

ABS 2013 Revised on 07-30-2013

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Same Clinical Process – Different Groups

Physics Checklist: Weekly QA of Chart

- ☐ Prescription signed in Diagnoses and Interventions (D&I) in MOSAIQ
- ☐ Treatment fields scheduled correctly and match in D&I
- ☐ CBCT scheduled correctly (if applicable)
- ☐ Weekly SSD checks performed and correct
- ☐ Check notes
- ☐ Complete chart check module

For new-start cases only:

- ☐ Case presented at QA rounds
- ☐ Attending ordered CBCT (if applicable)
- ☐ Attending ordered weekly physics check
- ☐ Diode measurements complete and signed (if applicable)
- ☐ IMRT or VMAT QA document complete and signed (if applicable)

Medical Physics Treatment Planning Weekly Chart Check

- ☐ Prescription complete and consistent
- ☐ Plan consistent to prescription
- ☐ Plan QA complete
- ☐ Treatment parameters verified
- ☐ Bolus verified
- ☐ Compensators and field modifiers verified
- ☐ Fractions delivered check
- ☐ Fractions remaining check

Further action(s) required: _____

Emphasize the fact that each practice needs to go through their own implementation and validation process

Checklists meets their specific needs

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Curious George and the rocket

Illustrations by H. A. Roy

Check List

- ☒ 1 Space suit... complete with shoes & gloves
- ☒ 1 Space helmet
- ☒ 1 Oxygen tank
- ☒ 2 Emergency rockets
- ☒ 1 Parachute

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Successful Checklists

- Effective checklists support the human thinking and creativity, allows constructive team member interactions, and facilitates a systematic care delivery.
- Effective checklists require a strong organizational and social infrastructure, as well as the application of well-defined human factor engineering concepts for their success.
- Checklists alone cannot do much; checklists in the appropriate organizational environment can definitely be an exceptional safety management tool.

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Acknowledgements

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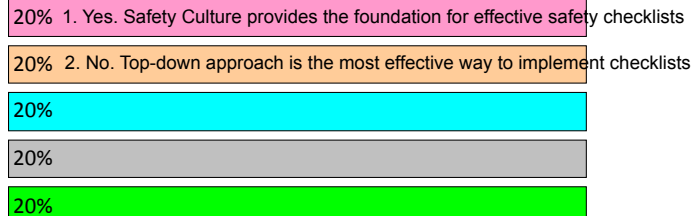
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Is safety culture a fundamental component of safety checklists?

Complex processes and environments



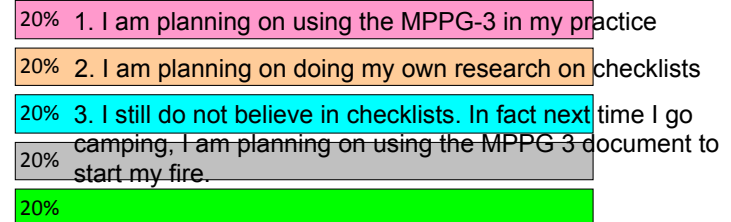
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