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“Before the Bur, Before the Blade”: A World Health Organization (WHO) Safety-First Approach to Dental Procedures- A Scoping Review.

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ABSTRACT :

Patient safety is now seen as a key part of quality dental care. While most dental work occurs in outpatient settings, there are many opportunities for mistakes, such as treating the wrong patient or site, medication errors, omitting important medical history, selecting the wrong tooth, leaving materials behind, lapses in infection control, communication problems, and errors during sedation or surgery. The World Health Organization (WHO) created the Surgical Safety Checklist to help prevent these errors and support teamwork. This 19-item checklist is used at three main points: before anesthesia, before the incision, and before the patient leaves the operating room. A major international study found that using the checklist led to fewer complications and deaths.

The WHO checklist was developed for surgery, but its core principles—such as confirming patient identity, checking procedures, anticipating risks, clear communication, teamwork, and post-procedure review—also apply well to dental care. Recent studies show growing interest in safety checklists tailored to dental procedures, especially in oral and maxillofacial surgery. A 2024 review identified 27 studies on dental patient safety checklists, but only 6 examined their effectiveness. This shows the approach is promising, but more solid evidence is needed.

This review covers the ideas behind the WHO Surgical Safety Checklist, how checklists can help reduce errors in dentistry, current trends in their use, challenges to implementing them, and future possibilities with digital dentistry, human factors engineering, artificial intelligence, electronic health records, and data-driven safety systems.

Keywords: WHO Surgical Safety Checklist; dental patient safety; human error; human factors; dentistry; oral surgery; surgical safety; checklist; communication; risk management; quality improvement.

Introduction

Patient safety has usually been a bigger focus in hospitals and major surgeries than in dentistry. Still, dental care is complex too, involving diagnosis, treatment planning, medications, procedures, technology, infection control, record-keeping, communication, and teamwork. Today, patient safety is seen as a shared responsibility. Problems rarely come from just one person's mistake. Instead, errors can happen because of how people, equipment, procedures, the environment, workload, communication, and systems all interact. This approach matters in dentistry, where many tasks are done quickly, often under time pressure. [1]

The WHO says patient safety is a fundamental part of healthcare and notes that avoidable errors and risks remain a global problem. Its Global Patient Safety Action Plan 2021–2030 highlights the importance of human factors, systems thinking, learning from mistakes, and making care processes safer.

The WHO Surgical Safety Checklist was created as part of the Safe Surgery Saves Lives initiative. It has 19 main items and is divided into three key stages: [2]

1. Sign In: before giving anaesthesia
2. Time Out: right before making the incision
3. Sign Out: before the patient leaves the operating room.

The idea behind the checklist matters:

“The goal is not rote recitation.” Instead, the checklist is meant to give the team a moment to pause, review key safety details, and discuss any risks. A major study by Haynes and colleagues showed that using the WHO checklist reduced complications in patients from 11.0% to 10.0% and reduced from 1.5% to 0.8% among surgical patients; these results should not be applied directly to everyday dentistry. Dental work is quite different from hospital surgery in terms of complexity, setting, anaesthesia, staff, and patients. It makes more sense to adapt the WHO checklist principles to dental routines rather than use the original checklist as it is. [3]

Concept of the WHO Surgical Safety Checklist

The WHO checklist serves as a tool to help with thinking and communication. It is not meant to take the place of professional judgment. Instead, it helps make sure that important safety steps are not missed, especially when people might forget or lose focus.

The checklist covers several important areas of safety: [4,5]

- * correct patient identification;
- * correct procedure;
- * correct anatomical site;
- * allergy status;
- * anticipated airway or anaesthetic problems;
- * availability of appropriate equipment;
- * infection-prevention measures;
- * anticipated critical events;
- * specimen identification;
- * instrument and sponge counts where applicable;
- * postoperative concerns;
- * communication among team members.

WHO points out that using the checklist effectively depends on strong leadership, teamwork, training, input from different specialties, feedback, and ensuring it fits local routines. So, a checklist is more than just a form. It is a way to change how the clinical team works together.

Why Human Error Matters in Dental Practice

There are many situations in dental practice that can lead to errors. [4-7]

1 Patient identification errors

Possible examples include: Treating the wrong patient; Failure to verify identity before treatment; Confusion between patients with similar names; and Inadequate confirmation of medical history.

2 Wrong-site or wrong-tooth treatment

Examples include: extraction of the wrong tooth; restoration of an incorrect tooth; treatment of the wrong quadrant; incorrect implant site; and incorrect surgical site. These types of errors can often be prevented by using checklists and having someone else double-check before starting treatment.

3 Medication errors

Dental treatment may involve: local anaesthetics; analgesics; antibiotics; sedatives; anticoagulant considerations; and emergency medications. Mistakes can happen if the wrong drug, dose, or method is used, if allergies are missed, or if drug interactions are not recognized.

4 Communication failures

Communication errors may occur between: dentist and patient; dentist and dental assistant; dentist and dental technician; surgeon and anaesthesia team; different clinicians involved in multidisciplinary care.

5 Procedural errors

In oral surgery and implant dentistry, mistakes can include: inadequate preoperative assessment; failure to review imaging; incorrect implant site; inappropriate instrument selection; retained foreign material; and inadequate postoperative instructions.

6 Cognitive errors

People's performance can be affected by fatigue, distraction, time pressure, confirmation bias, automation bias, overconfidence, interruptions, and multitasking.

So, patient safety is not just about avoiding mistakes by the dentist. It depends on the whole dental care system working well together.

How the WHO Checklist Can Be Adapted to Dentistry

The WHO checklist is not meant to be used exactly as it is in everyday dental practice. Instead, you can adapt its three-stage approach to fit the needs of dental care. [8-10]

Dental “Sign In”

Before initiating treatment: Patient verification. Confirm patient's name/identifier, confirm age where clinically relevant, verify planned procedure, confirm tooth/site/quadrant.

Medical assessment

Review relevant medical history. Confirm allergies. Review medications. Identify significant systemic conditions. Assess anticoagulant/antiplatelet therapy where relevant and assess previous anaesthetic complications.

Procedure verification

Confirm diagnosis. Confirm radiographs/CBCT where indicated. Verify treatment plan. Confirm informed consent.

Anaesthesia/sedation safety

Verify local anaesthetic agent. Confirm dose. Confirm vasoconstrictor considerations. Identify sedation-related risks where applicable.

Dental “Time Out”

Right before starting the procedure, the team should pause for a moment and say out loud:

“Correct patient, correct procedure, correct tooth or site, correct plan.” This step is especially important for procedures like:

extractions; implant placement; periodontal surgery; endodontic surgery; biopsies; oral and maxillofacial procedures; procedures under sedation/general anaesthesia.

A practical Dental Time-Out could include:

Safety element	Verification
Patient -----	Correct identity
Procedure -----	Correct procedure
Site -----	Correct tooth/quadrant/site
Imaging -----	Relevant imaging reviewed
Consent -----	Appropriate consent confirmed
Allergy -----	Confirmed
Medication -----	Relevant medications reviewed
Anaesthesia -----	Agent/dose appropriate
Equipment -----	Required equipment available
Infection control -----	Appropriate precautions confirmed
Anticipated risks -----	Discussed
Team communication -----	Roles clarified

Dental “Sign Out”

Make sure to complete the following steps before the patient leaves the treatment area:

- *Check that the procedure is finished.
- * Verify which tooth or site was treated.
- * If there are any specimens, make sure they are labelled correctly.
- * Ensure that bleeding has stopped.
- * Go over the postoperative instructions with the patient.
- * Check that any medications or prescriptions have been provided.
- * Schedule or confirm the follow-up appointment.
- * Record any complications or anything that did not go as planned.
- * Share any important postoperative concerns with the patient or team.

These steps are especially important for oral surgery, implant surgery, and procedures that involve pathology specimens.

Evidence Supporting Checklist Use in Dentistry

Research in dentistry is growing, but there is still less evidence compared to general surgery. One important publication introduced an 18-item checklist for ambulatory oral surgery, based on the WHO model. The checklist separates safety checks into those done before surgery and those done after surgery but before the patient leaves.

Another study looked at how a surgical safety checklist was used in an ambulatory oral and maxillofacial surgery department. It focused on patient safety and staff satisfaction. A recent scoping review identified 27 studies on patient safety checklists in dentistry published up to December 2023. Oral surgery was the most common area for checklist use, with 15 studies. Only six studies tested the effectiveness of the checklists, and five of those reported fewer incidents or improved patient care and safety. [11]

[K Zouaidi , T W Miner , M F Walji , E Kalendarian , D B Rindal , K J Suda. A scoping review of patient safety checklists in dentistry. Clin Oral Investig . 2024 Oct 18;28(11):603. doi: 10.1007/s00784-024-05996-6.]

This result is important because it suggests a key point:

The idea of using checklists in dentistry looks promising, but research in this area is not as advanced as it is for surgical checklists. Because of this, dental institutions should not claim that using checklists is a proven solution for all types of dental practice.

Limitations and Challenges

1 Checklist fatigue

If clinicians have to use too many checklists, they might stop paying close attention to them.

2 Tick-box behavior

The biggest risk is filling out the checklist automatically, without real communication.

The WHO warns that the checklist should not become something people just recite on autopilot.

3 Resistance among clinicians

Some practitioners might see checklists as unnecessary, time-consuming, bureaucratic, or an implication of inadequate competence.

4 Poor customization

A hospital surgical checklist might include things that do not apply to a regular dental clinic.

That is why:

“Adaptation, not duplication” should be the guiding principle for dental implementation.

5 Limited dental evidence

A recent dental review found only six effectiveness studies among 27, indicating there is little high-quality evidence.

6 Small dental teams

Many dental clinics have just one dentist and one assistant. So, using checklists must be practical and not add extra paperwork. [11]

12. Future Perspectives [12]

1 AI-assisted safety verification

In the future, dental software may be able to cross-check the following:

- * patient identity;
- * treatment plan;
- * tooth number;
- * radiographic findings;
- * planned procedure;
- * allergy status;
- * medication list.

For instance,

AI might spot a mismatch, such as: “Planned extraction: 36; selected radiograph: 46.” These systems should support clinical decisions rather than make them independently.

2 Computer-vision-assisted tooth verification

Combining intraoral photos, digital charts, and AI image recognition could help verify the following:

- * tooth number;
- * surgical site;
- * restoration location;
- * implant site.

Further research is needed to confirm diagnostic accuracy, false alert rates, and clinical safety before these tools can be used routinely.

3 Smart electronic checklists

In the future, checklists might be more flexible and adapt to each situation. Rather than showing 20 to 30 questions for every patient, the system could show only the questions that matter for each case.

For example:

Routine restoration: → allergy + patient + tooth + procedure. Implant surgery: → medical history + imaging + implant plan + surgical guide + medication + sterile equipment. Sedation: → fasting + airway + medications + monitoring + emergency equipment. This approach would probably make checklists less overwhelming.

4 Integration with Electronic Dental Records

A strong future model could use a closed-loop safety system: Assessment → Planning → Verification → Treatment → Documentation → Follow-up → Incident reporting → Learning. This would turn patient safety from a one-time checklist task into an ongoing process.

5 Simulation-based training

Dental students and trainees could practice with simulated scenarios such as:

- wrong-tooth identification;
- medical emergency;
- drug allergy;
- local anaesthetic overdose;
- implant-site discrepancy;
- equipment failure;
- communication breakdown.

The checklist could also be used as part of these simulation exercises.

6 Safety culture education in dental curricula

Patient safety and human factors should become a clear part of both undergraduate and postgraduate dental education.

Curricula could include:

- human error;
- cognitive bias;
- situational awareness;
- teamwork;
- communication;
- incident reporting;
- root-cause analysis;
- Swiss Cheese Model;
- checklist design;
- crisis-resource management.

Proposed Dental Safety Checklist Framework

Not only for Oral surgery and Implant surgery, this is a proposed Dental checklist frame work.

A practical framework for dental clinics could be:

DENTAL SAFETY CHECK

- D – Doctor/team identification
- E – Evaluate medical history and allergies
- N – Name/identify patient and tooth/site
- T – Treatment and consent verification
- A – Anaesthesia/medication verification
- L – Look at imaging and laboratory information
- S – Surgical/procedural site confirmation
- A – Anticipate risks
- F – Facilities/equipment ready
- E – Emergency preparedness
- T – Team Time-Out
- Y – Yield: postoperative verification and communication

This is just a suggested framework, not a proven clinical checklist. It would need formal studies before it could be recommended as a standard tool.

1. Research Priorities

Future dental research should go beyond simply asking whether a checklist is being used.

Important research questions include:

2. Does checklist implementation reduce wrong-site/wrong-tooth events?
3. Does it reduce medication errors?
4. Does it improve identification of medical risks?
5. Does it improve team communication?
6. Does it influence adverse-event reporting?
7. Does it improve patient satisfaction?
8. Does it improve staff safety culture?
9. What is the optimal checklist length?
10. Paper versus electronic checklist—which produces better adherence?
11. Can AI-assisted checklists reduce clinically important errors?
12. What are the cost-effectiveness implications?
13. Which checklist components provide the greatest safety benefit?

Studies such as cluster-randomized trials, time-series research, and multi-center quality improvement projects would provide stronger evidence than

single before-and-after reports.

Discussion

The WHO Surgical Safety Checklist is one of the most important examples of structured safety interventions in modern healthcare. Its success comes not just from the checklist itself, but from the changes it encourages, such as deliberate pauses, better communication, shared awareness, and careful verification.

The original WHO study offers strong evidence for surgical patients, but this evidence should be understood in its original context. The study focused on noncardiac surgeries in eight hospitals, not on routine dental procedures.

There is less evidence available for dentistry. However, the creation of checklists for oral surgery and new research on dental safety checklists show that more people now recognize the need for systematic ways to prevent errors in dentistry.

A recent scoping review is important because it shows both progress and a gap in evidence. While 27 studies were found, only 6 actually tested the effectiveness of the checklists.

So, the future of dental checklists should not just mean adding more paperwork to daily practice. Instead, new checklists should be designed using human factors engineering, focusing on simplicity, ease of use, integration into daily routines, clear communication, and ongoing review.

The WHO also highlights the importance of adapting checklists to local needs, strong leadership, education, interdisciplinary teamwork, and regular feedback when implementing checklists.

In the future, paper checklists may be replaced by a digital safety system. This system could connect electronic dental records, imaging, digital treatment planning, AI checks, and clinical checklists to spot problems before they cause harm.

Conclusion

The WHO Surgical Safety Checklist offers a strong framework for reducing preventable errors by standardizing processes, verifying steps, improving communication, and encouraging teamwork. However, since the original evidence comes from surgery, its results should not be assumed to apply to all dental procedures. Still, these principles are very relevant to dentistry, especially for oral surgery, implants, sedation, and other invasive treatments. Current research indicates that more dental practices are using patient safety checklists, but the evidence remains limited and varied. Going forward, efforts should focus on creating validated, procedure-specific, user-friendly, and digital dental checklists rather than simply copying the original WHO surgical checklist.

This new approach can be summed up as: “From checklist compliance to safety culture; from individual vigilance to system resilience. “Here, the checklist should not be seen as just another form to fill out. Instead, it acts as a safety tool that gives the dental team a chance to pause, talk, check, and stop mistakes before they affect the patient.

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