

# Human factors in dental Implantology

## – uncovering the black box

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The field of human factors is incredibly diverse and increasingly important in medical research. It's estimated that nearly 80% of medical complications stem from non-technical errors. However, when the "human factor" acts as a black box between the input and resulting complications, conducting research and measuring it can be a challenge. This poster presents the results of systematic literature searches that highlight only two specific points but reveal this field's vast spectrum of possibilities.

### Surgical safety checklists for dental implant surgeries

Elective surgeries share many similarities with air travel. It's not always the knowledge of the pilot or surgeon that's crucial, but rather the so-called human factors. Checklists are a well-known solution to overcome some of these

problems. While they're particularly established in aviation, many surgical specialties have adopted this successful concept. Therefore, it's imperative that checklists also become an integral part of implant dentistry.

### Results

- Three publications included for qualitative synthesis
- Two implant checklists based on literature research and expert opinion
- Always divided into three sections: pre-, intra-, and postoperative
- Third study: compliance of inexperienced prosthodontists to the use of a checklist
- The Eight participating residents used it in 100% of the surgeries they performed

### Discussion

- Evidence for checklists in dental implantology is low
- No study investigates the effectiveness of checklists in reducing complications
- There is a need to catch up → Creation of an own safety checklist by reviewing further literature and cooperating with experienced surgeons
- Future studies should investigate effectiveness, compliance of the practitioners, additional time needed, and differences between the surgeons
- They will help to place the presented checklist on a broad foundation
- **The checklist should be a universal tool for quality assurance and for improving patient safety**

Treatment planning (Checklist before surgery is scheduled)		✓	✗
1) Medical history	Anticoagulation	<input type="checkbox"/>	<input type="checkbox"/>
	Antiresorptive medication (Bisphosphonates, Denosumab)	<input type="checkbox"/>	<input type="checkbox"/>
	Diabetes mellitus	<input type="checkbox"/>	<input type="checkbox"/>
	Radiotherapy	<input type="checkbox"/>	<input type="checkbox"/>
	Smoking	<input type="checkbox"/>	<input type="checkbox"/>
	Allergies	<input type="checkbox"/>	<input type="checkbox"/>
2) Periodontal pre-treatment		<input type="checkbox"/>	<input type="checkbox"/>
3) Radiographs available and adequate	2D	<input type="checkbox"/>	<input type="checkbox"/>
	3D	<input type="checkbox"/>	<input type="checkbox"/>
4) Adequate anaesthesia	Local anaesthesia	<input type="checkbox"/>	<input type="checkbox"/>
	Sedation	<input type="checkbox"/>	<input type="checkbox"/>
	ITN	<input type="checkbox"/>	<input type="checkbox"/>
5) Guided Workflow	3D-Radiographs	<input type="checkbox"/>	<input type="checkbox"/>
	Digital impression	<input type="checkbox"/>	<input type="checkbox"/>
	Treatment planning initiated	<input type="checkbox"/>	<input type="checkbox"/>
	Instruments	<input type="checkbox"/>	<input type="checkbox"/>
6) Necessary materials available	Implants	<input type="checkbox"/>	<input type="checkbox"/>
	Biomaterials	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>
7) Informed consent signed		<input type="checkbox"/>	<input type="checkbox"/>
8) Medication prescriptions given and explained		<input type="checkbox"/>	<input type="checkbox"/>

Pre-operative (Checklist before surgery)		✓	✗
1) Patient identity verified		<input type="checkbox"/>	<input type="checkbox"/>
2) Update of the medical history		<input type="checkbox"/>	<input type="checkbox"/>
3) Pre-surgical medications taken	Antibiotics	<input type="checkbox"/>	<input type="checkbox"/>
	Analgesics	<input type="checkbox"/>	<input type="checkbox"/>
	Steroids	<input type="checkbox"/>	<input type="checkbox"/>
4) PRF/PRP necessary and prepared		<input type="checkbox"/>	<input type="checkbox"/>
5) Material available, sterile, and functioning	Instruments	<input type="checkbox"/>	<input type="checkbox"/>
	Implants	<input type="checkbox"/>	<input type="checkbox"/>
	Biomaterials	<input type="checkbox"/>	<input type="checkbox"/>
	Drilling template/splint	<input type="checkbox"/>	<input type="checkbox"/>
	Temporary prosthesis/protective splint	<input type="checkbox"/>	<input type="checkbox"/>

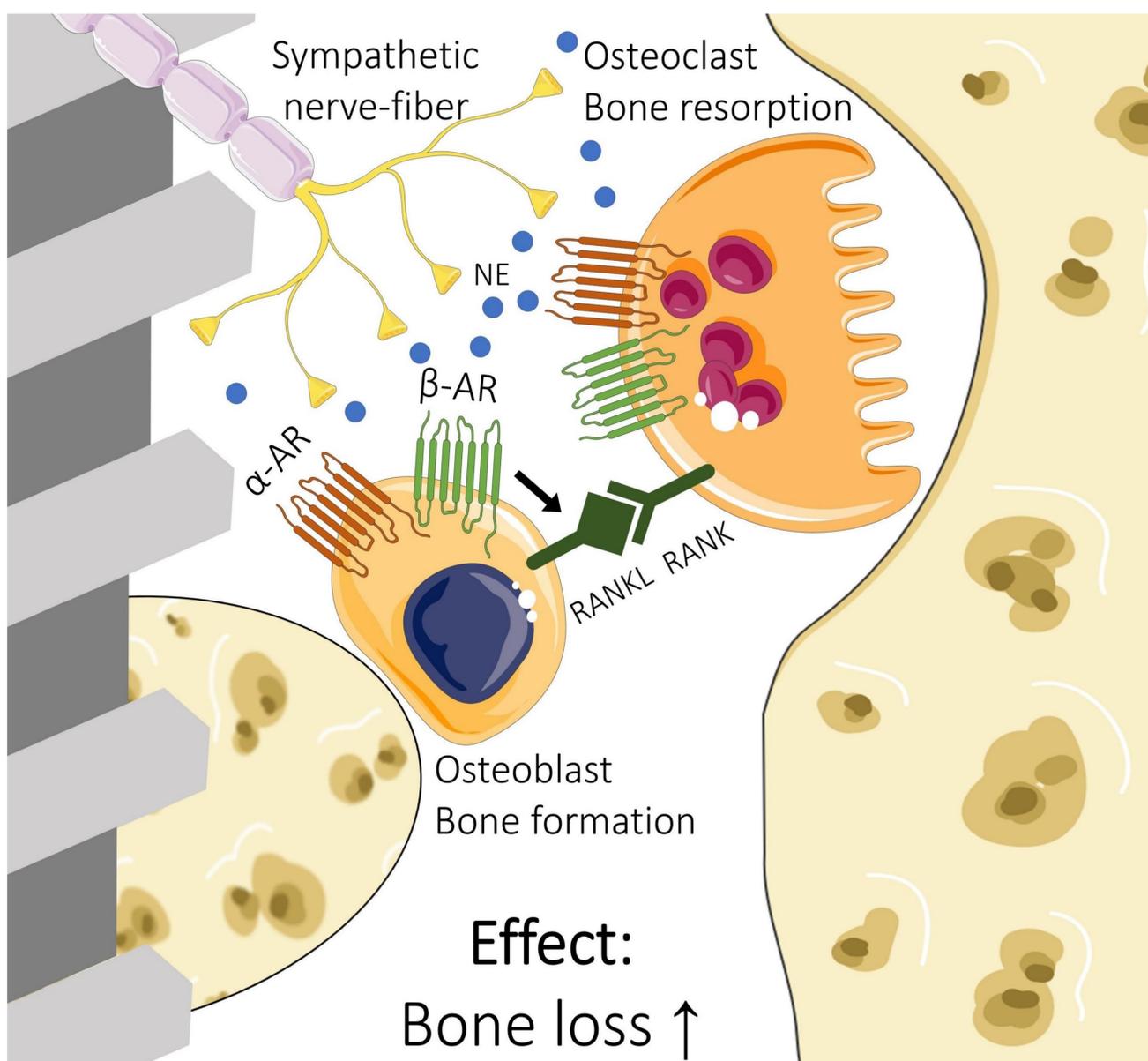
Post-operative (Checklist before patient is checked out)		✓	✗
1) Adequate case documentation		<input type="checkbox"/>	<input type="checkbox"/>
2) Post-operative radiographs sufficient		<input type="checkbox"/>	<input type="checkbox"/>
3) Post-operative patient instructions given?		<input type="checkbox"/>	<input type="checkbox"/>
3) Post-operative medications given/prescribed?	Antibiotics	<input type="checkbox"/>	<input type="checkbox"/>
	Analgesics	<input type="checkbox"/>	<input type="checkbox"/>
	Steroids	<input type="checkbox"/>	<input type="checkbox"/>
6) Temporary prosthesis/Haemostatic dressing material		<input type="checkbox"/>	<input type="checkbox"/>
8) Schedule follow-up appointment		<input type="checkbox"/>	<input type="checkbox"/>
9) Provide restorative notes to prosthetic dentist		<input type="checkbox"/>	<input type="checkbox"/>

### The sympathetic nervous system in dental implantology

One area of Human Factors deals with stress, which has a significant influence on both surgeons and patients. The underlying physiological processes may be highly relevant to implantology.

The sympathetic nervous system plays a vital role in various regulatory mechanisms, including the well-known fight-or-flight response and the processing of external

stressors. In addition to many other tissues, the sympathetic nervous system influences bone metabolism, which could have a crucial impact on osseointegration, responsible for the long-term success of dental implants. Therefore, this review aims to summarize the current literature on this topic and identify future research perspectives.



### Results

- One in vitro study showed differences in mRNA expression of adrenoceptors cultured on implant surfaces
- In vivo, sympathectomy impaired osseointegration in mice
- Electrical stimulation of sympathetic nerves improved it
- Propranolol had a positive effect on histological parameters and micro-CT measurements
- Retrospective clinical studies: especially antidepressants that increase norepinephrine concentrations are reducing implant success; no differences in implant stability were found under Beta-blocker therapy.

### Discussion

- The data situation is heterogeneous.
- **The available publications reveal the potential for future research, the development of new therapeutic strategies, and the identification of risk factors for dental implant failure.**

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