

# Impact of the "Guidelines for infection prevention in dentistry" (2006) by the Commission of Hospital Hygiene and Infection Prevention at the Robert Koch-Institute (KRINKO) on hygiene management in dental practices – analysis of a survey from 2009

## Einfluss der Empfehlungen der Kommission für Krankenhaushygiene und Infektionsprävention (KRINKO) beim Robert Koch-Institut auf das Hygienemanagement von Zahnarztpraxen – Analyse einer Erhebung von 2009

### Abstract

**Aim:** To assess trends in hygiene management in dental practices in comparison to an earlier survey in 2002/2003 and to point out key aspects for future efforts.

**Method:** The infection prevention management of all dental practices in Greifswald (n=35) was determined by a questionnaire in a personal interview in 2008/2009.

**Results:** 26% of the dentists did not use sufficient personal protective equipment during the general examination of the patient. In conservative and prosthetic dentistry, 15% still did not use adequate measures and 9% did not even in surgical interventions.

Vaccination coverage was clearly too low, as only 35% of dentists were vaccinated against influenza and coverage with other vaccinations was also quite low.

11% of the dentists did not perform a documented anamnesis and in 29% of the dental practices no appointment system for risk patients existed.

There were significant deficiencies in the reprocessing of medical devices and in the equipment needed for reprocessing. The opportunity to participate in further training in this field was rejected by 23% of the dentists.

In 10 dental practices, the colony count in the dental unit water-conducting system was five times higher than the limit. A contamination with *P. aeruginosa* was discovered in 4 practices. All units were renovated.

**Discussion:** Overall, both the hygiene management and hygiene equipment in the practices have improved considerably compared to the previous survey in 2002/2003. This demonstrates the positive effect of the KRINKO guidelines from 2006. However, the survey again showed relevant deficiencies in the hygiene management of dental practices, which agrees with a Germany-wide online survey from 2009.

**Conclusion:** While the study revealed persistent deficiencies in hygiene management, especially in reprocessing, it confirms that the KRINKO guidelines for dental practices from 2006 led to significant improvements in hygiene management. Doubts about the impact of the guidelines are not backed by evidence.

**Keywords:** hygiene status, dental practices, organization of dental practices, staff protection, vaccination, hand hygiene, anamnesis, processing, water safety

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## Zusammenfassung

**Zielsetzung:** Es sollte die Entwicklung des Hygienestatus seit der letzten Befragung aus dem Jahr 2002/2003 nach Einführung der KRINKO-Empfehlung zur Infektionsprävention in der Zahnheilkunde im Jahr 2006 analysiert werden, um ggf. Schwerpunkte für künftige Bemühungen aufzuzeigen.

**Methode:** Mit Hilfe eines Fragebogens wurde im Zeitraum 2008/2009 in einem persönlichen Interview der Hygienestatus aller Greifswalder Zahnarztpraxen (n=35) ermittelt.

**Ergebnisse:** Es wurde eine Reihe von Defiziten offenkundig. 26% der Zahnärzte waren bei der allgemeinen Untersuchung des Patienten nicht ausreichend durch präventive Maßnahmen geschützt. Bei konservierenden und prothetischen Arbeiten reduzierte sich dieser Anteil auf 15%, bei chirurgischen Eingriffen auf 9%. Die Impfquote gegen Influenza war mit 35% deutlich zu niedrig. Aber auch bei anderen Schutzimpfungen zeigten sich z.T. empfindliche Impflücken.

11% der Zahnärzte führten keine dokumentierte Anamnese durch und in 29% der Praxen existierte kein Bestellsystem für Risikopatienten.

Erhebliche Mängel bestanden bei der Aufbereitung von Medizinprodukten und der hierfür erforderlichen Ausstattung. Die Teilnahme an Fortbildungen hierzu wurde von 23% der Zahnärzte abgelehnt.

In 10 Praxen überschritt die Koloniezahl im wasserführenden System der Dentaleinheit den Grenzwert durchschnittlich 5-fach. Eine Kontamination mit *P. aeruginosa* wurde in 4 Praxen festgestellt. Alle Einheiten konnten saniert werden.

**Diskussion:** Beim Vergleich mit dem Hygienestatus in Zahnarztpraxen aus den Jahren 2002/2003 kann festgestellt werden, dass sich die Maßnahmen zur Infektionsprävention sowie die Ausstattung der Praxen mit Hygienetechnik überwiegend erheblich verbessert haben. Diese positive Entwicklung dürfte maßgeblich auf die Empfehlung der KRINKO aus dem Jahr 2006 zurückführbar sein. Trotzdem besteht nach wie vor Optimierungspotenzial, wie die vorgelegte Stichprobe in Übereinstimmung zu einer deutschlandweiten Online-Befragung von 2009 zeigt.

**Schlussfolgerung:** Die z.T. in der Öffentlichkeit geäußerte Kritik, dass die neue KRINKO-Richtlinie nicht zu einer substantziellen Verbesserung des Hygienestandards geführt habe, konnte nicht bestätigt werden.

**Schlüsselwörter:** Hygienestatus, Zahnarztpraxen, Praxisorganisation, Personalschutz, Schutzimpfungen, Händehygiene, Anamneseerhebung, Aufbereitung, Wassersicherheit

## Introduction

Guidelines for hygiene management in dentistry have a long history in Germany. The "Deutscher Arbeitskreis für Hygiene in der Zahnmedizin (DAHZ)" [the German working group for hygiene in dental medicine] has developed guidelines to specify the hygienic challenges of dental medicine since 1989. The 8th edition of these guidelines has been published in 2011 [1].

Official recommendations on hygiene requirements in dentistry were published by the Commission of Hospital Hygiene and Infection Prevention at the Robert Koch Institute (KRINKO) in 1998 [2] for the first time and updated in 2006 [3]. For the individual practice, the revised KRINKO guidelines mean an increased work load in terms of reprocessing medical devices, as well as investments

in equipment and additional costs. Moreover, ensuring and controlling the drinking water quality in the dental unit's water-conducting system involves a great deal more effort.

In 2003, a survey of dentists in the city of Greifswald, West-Pomerania, Germany was conducted by the Institute of Hygiene and Environmental Medicine, Greifswald to assess hygiene management in dental practices. This present study is a follow-up to the earlier one to analyze whether hygiene management in dental practices in Greifswald has improved since 2003.

## Method

Hygiene management was assessed using a questionnaire. The survey took place from July 2008 until April

2009. At the time of the survey, there were 35 dental practices in Greifswald, all of which without exception agreed to answer the questionnaire in a personal interview while anonymity was ensured. The survey took 60 to 120 minutes per dental practice.

The following aspects were analyzed: characteristics and profile of the practices, spacial structure, organization concerning hygiene management, staff protection, vaccination, hand hygiene, anamnesis, water safety, reprocessing of medical devices, prosthetic disinfection, reprocessing of the suction unit, method, validation, monitoring and documentation of sterilization of medical equipment, and storage period limits of sterilized material.

Furthermore, the contamination of dental units was examined microbiologically in cooperation with the Public Health Department of the City of Greifswald. For water testing, one water sample from a treatment unit – determined by the dentist – was taken from the cooling water system and another from the drinking water. The system was flushed two minutes before sampling in order to prevent confounding results by stagnant and therefore possibly extrinsically contaminated cooling and drinking water. For each sample, 500 ml of water were taken from the handpiece and the drinking water faucet of the unit. The water was examined for the total colony count, *Legionella* spp., and *Pseudomonas aeruginosa*, as described in [4]. The temperature of the water samples was 36 °C for all dental units.

## Results

### Characteristics of the dental practices

All dental practices in Greifswald (17 male, 18 female practice owners) participated in the survey. The greatest percentage of the dentists, i.e., 40%, were 41–50 years old. 33 practices were general dental practices, and 15 of those did small surgical interventions. Two practices were specialized in oral surgery and orthodontics.

### Organization of the dental practice from a hygienic point of view

All dental practices worked on the basis of a hygiene plan according to the practical requirements. A risk assessment for medical devices with standard operating procedures for reprocessing existed in 34 practices (97%). 86% of the practices performed reprocessing for uncritical, semicritical and critical medical devices. A skin protection plan existed in 33 practices (33%).

91% of the dentists had complete documentation of the vaccination status of every employee.

An instructional session on the German Ordinance on Biological Agents was held twice a year by 8 practices (23%), once a year by 24 practices (69%) and at longer intervals by 3 practices (9%). 25 (71%) practicing dentists had a contractual commitment with a company doctor for their staff. In 10 practices (28,6%) the employees

could choose a company doctor themselves. In most cases, the check-up exam by this doctor was conducted every 3 years.

### Spacial structure

With one exception, the separation between work clothes and casual wear was upheld. 25 (71%) practices had a reprocessing room and 10 (29%) practices had a reprocessing zone.

### Hand hygiene

In 6 (17%) practices, there were communal towels in the bathroom. Whereas soap dispensers existed in every practice, dispensers for hand disinfectants were only found in 18 practices (51%). Bars of soap were provided in 4 (11,4%) practices.

In contrast, there were no bars of soap or communal towels used in the treatment rooms. 5 (14%) practices did not have a sink with a tap which could be used without using the hands. Soap and disinfectant dispensers were present in the treatment rooms of 34 practices.

Before general work preparation, all dentists washed their hands. 32 of them also disinfected them. 21 dentists (60%) washed their hands before treatment, before and after every break, at the end of the work day and after going to the toilet. Pre-treatment hand disinfection was done by 31 (89%) dentists. With the exception of one dentist, all disinfected their hands before and after every break and also after going to the toilet. 32 (91%) disinfected their hands after finishing work for the day.

20 (59%) dentists who practice surgery washed their hands with soap and disinfected them before operating. 15 (41%) disinfected but did not wash their hands with soap prior to that.

Hand-care products were provided in tubes in 25 (71%) practices and in tins in 4 (12%) practices. 5 practices used disposable dispensers, 8 used refillable dispensers, i.e. some used different options at the same time.

The dispensers for soap and hand-care products were cleaned and disinfected before refilling in 22 (63%) practices. 7 (20%) practices cleaned the dispensers but did not disinfect them. 4 (11%) practices disinfected the dispensers without cleaning them beforehand. In 2 (6%) practices, no cleaning or disinfection of the dispensers took place.

### Staff protection and vaccination

18 (51%) dentists continued using the same gloves used in patient treatment. However, the gloves were changed when soiling or damage were visible and after the treatment of risk patients.

Only 26 (74%) dentists wore gloves, a surgical face mask and eye protection during the examination. The protective measures were 85% met in restorative and prosthetic procedures and 91% met in surgical procedures.

There were considerable deficits in the vaccination status: 12 dentists were immunized against varicella and viral influenza, 20 against pertussis, 22 against mumps and measles, 24 against hepatitis A, 33 against hepatitis B, 34 against diphtheria and 35 against tetanus.

## Anamnesis

4 (11%) dentists did not conduct a documented anamnesis, and in 10 (29%) dental practices, patients with an increased risk of infection were not given separate appointments. The anamneses focussed on questions about endocarditis, regular medication, HIV, diabetes and pregnancy. Information about childhood diseases and diarrhea was neglected. 3 dentists did not ask about tuberculosis, hepatitis or coagulation disorders.

## Antisepsis

Here, the result was very revealing because hardly any data were available for the antiseptics used. In 33 (94%) of the dental practices, products based on chlorhexidine were used, and in 10 (29%) ethereal oils were used. In order to support the mechanical removal of plaque, stannous fluoride was used in most cases (22 practices). In 27 practices, chlorhexidine digluconate was used, ethereal oils in 10 practices. Octenidine, a more effective, easier-to-absorb alternative to chlorhexide, was still largely unknown.

## Reprocessing

The willingness to participate in further training in this complex field was absent in 8 (23%) dentists. This phenomenon was also reflected in the results of the analysis. In 2 (6%) dental practices, operating instructions and procedures for reprocessing were non-existent. In 7 (20%) practices, no one had been specifically designated as responsible for the reprocessing of the medical devices. 23% of the employees had not participated in a course in reprocessing medical devices since the new RKI guidelines were published. In 7 practices, no validation had occurred after the sterilizers were set up.

8 (23%) practices did not use a chemical indicator for the batch control. 3 of the other practices only ran a control once a day. For monitoring, 24 (68%) practices used a PCD (helix test) with an indicator. It was alarming that 6 (17%) dentists did not know which type of sterilizer they had in their practices. In 2 (6%) practices, sterilization was done in a type N sterilizer, which is obsolete for semicritical medical devices B. 25 (71%) practices had a water-processing system in order to make distilled water for the sterilizer.

The sterilization processes were documented automatically in 23 (66%) practices and manually in 16 (46%) practices, i.e., in two cases, both processes were done parallel. However, only 28 practices monitored all the required sterilization parameters.

The angled handpieces were only reprocessed by 15 (43%) dentists after every patient treated. In 13 (37%) practices, they were reprocessed 2–3 times per day, in 6 (17%) practices only once a day, and in one practice, even less than that. Solely manual reprocessing was done in 14 (40%) practices, 2 of which did not do a final sterilization in autoclaves. 12 (34%) reprocessed handpieces and angled handpieces only mechanically. Both procedures were carried out in 9 (26%) practices.

Without exception, the dental drills were first reprocessed by a drill bath and sterilized afterwards.

34 (97%) practices used disinfectants listed by the German Association for Applied Hygiene (VAH). An instrument bath with a cover was available in all practices, a measuring device in 34 (97%) and an ultrasonic bath in 22 (63%) practices.

The risk classification for medical devices was adequately available in 31 (89%) practices.

31 (89%) dentists disinfected the tube opening of the suction unit and the mouth rinser after every treatment. 34 (97%) dentists used a new suction cannula after every treatment and 30 (86%) flushed the system for 2 minutes after every patient treated.

## Microbiological water quality in the dental units

In the dental units of 27 (77%) practices, a water filter was provided; this was changed regularly in 11 (41%) practices. 22 (63%) practices had a water-filtering system. The water systems were flushed for 2 minutes after every treatment and at the beginning of a work day by all dentists. Only 2 (6%) dentists had a water sample microbiologically examined once a year.

In 10 (29%) practices, the colony count exceeded the official limit for drinking water with an average of 550 CFU/ml. *P. aeruginosa* was detected in 4 practices, in 3 of which these bacteria were found in the cooling water of the turbine. The values ranged between 180 and 200 CFU/100 ml. *Legionella* ssp. was not detected in any of the practices.

## Discussion

When comparing the three analyses of the hygiene status in German dental practices from 2002/2003 [5], 2005 [6] and 2009, it can be stated that both hygiene management and hygiene equipment have considerably improved in most cases (Table 1) since 2002/2003. This positive development shows the impact of the KRINKO guidelines [3] and the various efforts made by the Dental Association in order to implement these guidelines. However, there is still potential for optimizing hygiene management, as repeatedly shown in this sample from Greifswald in 2008/2009, which is in accordance with a Germany-wide online survey from 2009 [6].

An instructional session on the German Ordinance on Biological Agents was not held at the stipulated intervals



**Table 1: Development of hygiene management in dental practices since 2002/2003**

Item	2002/2003 [5] Berlin/Greifswald/ Magdeburg	2009 [6]	2008/2009 Greifswald
	Implementation (% of the dental practices)		
Hygiene plan	79/98/97	99	100
Infection anamnesis	80/84/82	Not recorded	89
Appointment system for risk patients	34/43/36		90
Sink/tap without touching	Not recorded	86	86
Soap dispensers		77	97
Disinfectant dispensers		82	97
Disposable towel treatment room		98	100
Hand disinfection before every non-invasive procedure	20/50/34	76	89
Surgical hand disinfection before every invasive procedure	39/92/92	73	100
Protective gloves for non-invasive procedure, in general	75/61/59	66	85
Protective gloves for invasive procedure	89/90/98	Not recorded	91
Reprocessing of dispensers before refilling	26/77/72		94
Use of hand-care products	95/92/98		100
Surgical face mask	39/39/55	70	85
Eye protection	64/63/60	32	85
Classification of risks of medical devices	Not recorded	87	89
SOP reprocessing handpieces		83	97
Ultrasonic cleaning device		76	63
Principally mechanical reprocessing		45	60
Reprocessing handpieces after every patient	26/10/8	89	43
Sterilizer type N	Not recorded	4	6
Sterilizer type unknown		13	17

in 3 practices. The fact that one practice did not have any standard operating procedure for the reprocessing of medical devices is not acceptable. Furthermore, the absence of a skin protection plan in 2 practices is an organizational and administrative deficit.

Although providing hand hygiene is not linked to high investments, there are still unacceptable deficiencies, despite the positive development. This applies particularly to the 11% of dentists who do not disinfect their hands before patient treatment (Table 1).

Also, staff protection can be optimized, particularly in terms of vaccination. There were two individuals who were not even vaccinated against hepatitis B, which is simply irresponsible given the danger [7].

In terms of the reprocessing of medical devices, quality management in the practice means assigning responsibility for each step while taking the risk classification of the medical devices into account, defining storage, validation and documentation, and creating a concept for routine monitoring. Here, marked deficiencies still exist.. Small steam sterilizers with sterilization cycle N, still widely used, are only approved for the sterilization of solid (not hollow) unpackaged medical devices.

The handpieces were not reprocessed after every patient treatment, which is intolerable in terms of patient safety (Table 1).

The detection of *P. aeruginosa* in the water-conducting system of the dental unit in 4 practices must be seen critically. Through intensive cleaning and disinfection, drinking-water quality was achieved.

## Conclusion

Our study confirms other reports that the KRINKO guidelines for dental practices in 2006 led to substantial improvements in hygiene management. Especially personal standard hygiene measures (e.g., hand disinfection, glove use) and the underlying hygiene management have significantly improved over time. Standards for reprocessing and sterilization of medical equipment that are more technical and cost-intensive have also improved, but are still unsatisfactory. Public criticism questioning the impact of the guidelines and the work of other groups on improving the hygienic safety in dentistry in Germany is substantiated neither by the comparison with the

Greifswald study of 2002/2003 nor by other comparable studies.

## Notes

## Competing interests

The authors declare that they have no competing interests.

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