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# Patient safety incident prevention and management among Finnish dentists

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**Abstract**

***Objective.*** Assessing current patient safety incident (PSI) prevention measures and risk management practices among Finnish dentists. ***Materials and methods.*** A total of 1041 dentists practicing in the private or public sectors in southern Finland completed an online questionnaire concerning PSI prevention, PSI-reporting systems, feedback and knowledge gained from device incidents and patient-generated safety information and the knowledge of national PS-guidance. The answers were handled anonymously. Statistical evaluations were performed using chi-square analysis. ***Results.*** Dentists suggested multiple methods for preventing PSIs related to dental diagnostics, various treatments, equipment and devices, medications, communication, infection control and general practice safety. Preventive methods reported most frequently included working with caution and forethought, keeping accurate patient records and the availability of correct patient information. A special PSI-reporting system was used by less than one third of respondents. Feedback received on PS-related data and the utilization of guidebooks varied significantly between the studied dentist groups. ***Conclusions.*** Several PSI prevention techniques are already used in Finland. However, wide variation exists in PSI prevention and risk management practices among Finnish dentists. Systematic implementation of available safety methods would probably prevent several PSIs. The results indicate that the more dentists know about PS risks, the easier it is for them to recognize situations possibly leading to patient harm. Anonymous PSI reports, patient complaints and claims data should, therefore, be actively used for mutual learning. Increased PS education in dentistry is also needed.

**Key Words:** *adverse event reporting, dentistry, incident prevention, patient safety, risk management*

## Introduction

Patient safety (PS) is a current global health issue, as adverse events (AEs) occur in all healthcare settings, resulting in many harmed patients. Quite recently the World Health Organization (WHO) [1], in collaboration with the World Dental Federation (FDI), the Council of European Dentists (CED) [2], the American Academy of Pediatric Dentistry (AAPD) [3] and several researchers [4–9] have addressed the need for a safety culture in dentistry, where professionals can learn from each other. Both negative and positive PS data and experiences should be shared [9].

Errors in healthcare arise from human error or system-based errors [10], where latent conditions in the system (deficiencies in leadership, facilities, etc.) allow errors to occur. Some are unpredictable accidents [11], but nearly half of such events are deemed preventable. Until recently, PS research has been focused on hospital care [12]. Dentists most commonly work in primary care where the number of treated patients far exceeds the number of secondary care patients. It is therefore possible that errors occurring in primary care are more frequent than hospital reports show [8]. Many dental PSIs have several causes and contributing factors [3,6–8,11,13–16] and an understanding of them is required for reducing their incidence.

Dental PSIs include AEs and near misses (NMs). AEs consist of accidents, errors and complications, while NMs are events that nearly cause harm to a patient but are avoided by luck or by preventive action

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at the last moment [9]. Some dental AEs are reportedly preventable [8,17]. Until currently practitioners have mainly developed their own error prevention strategies [18,19] and only a few systematic efforts have been introduced [4]. Although the dental profession can benefit from PS studies performed in other healthcare sectors [9,20], it is important to develop PSI prevention measures suitable and designed especially for dentistry [4], as the type and causes of patient harm varies in different healthcare settings [2].

*Aims of the study*

We aimed to study dentists' (1) conceptions of possible dental PSI prevention measures, (2) current risk management practices, (3) utilization of current national PS guides and (4) systems utilized for PSI reporting.

## Methods

*Patient safety in Finland*

Finnish healthcare delivery systems are fairly organized and advanced. Focusing on PS-related issues is a recent development [21]. During the previous decade, Finnish healthcare officials have begun several PS-related projects and published a national PS strategy and several guidebooks, including topics such as medication safety, safe surgery, general practice safety and PSI reporting [21]. Since 2007, utilization of a voluntary and anonymous PSI reporting system (HaiPro [22]) has been growing among various healthcare organizations.

If a patient or next of kin is unsatisfied with medical care or treatment in Finland, they have the right to submit an objection to the Health Care Director of the unit in question or file a complaint to authorities responsible for healthcare supervision, i.e. the National Supervisory Authority for Welfare and Health (Valvira) and one of the Regional State Administrative Agencies (AVI). The supervising authorities can provide administrative guidance to healthcare professionals but cannot award compensation for healthcare-related injuries. If patient injury is suspected, the patient can file a claim to the Finnish Patient Insurance Centre (FPIC). Healthcare providers, including dentists, are obligated to report medical device incidents to the Valvira, including AEs and NMs.

The Finnish PS strategy aims to reduce PSIs in all healthcare settings by 50% by 2020 [23]. To also reach this target in dentistry, it is vital to understand different dental PSI types, as well as factors contributing and preventing dental PSIs. Yet only a few studies have examined PS data related to Finnish dentistry [7].

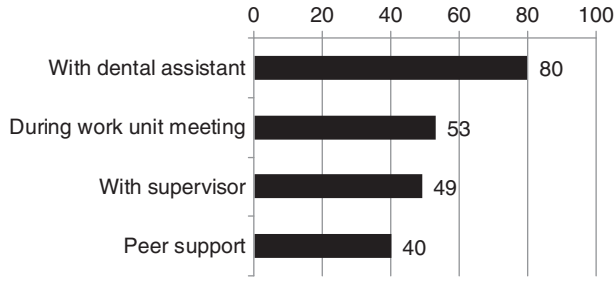


Figure 1. PSI discussion habits of respondents %, $n$ = 1016. Multiple answers allowed.

## Study design and population

The dental care system in Finland consists of a public and private sector, with approximately equal numbers of practicing dentists in both. The public sector mainly consists of health centers, with additional public sector healthcare delivered by public hospitals, universities, the Finnish Defence Forces and the Finnish Student Health Service (FSHS).

All public and private dentists working in one of the regions administered by the southern, southwestern and western and inland Finland AVIs and who were members of the Finnish Dental Association ($n$ = 1914) were e-mailed a structured Internet questionnaire (Webropol®). The study design is described in detail in our previous article based on the same survey material [7].

*Questionnaire*

The dentists were asked to describe in open-text the circumstances leading to dental PSIs (during the past 12 months) and how PSIs could be prevented in the future. The questionnaire also contained multiple-choice questions enquiring about dentists':

(1) Habits of discussing PSIs (with their supervisors/colleagues/during team meetings/with dental assistants or if no such practices exist).
(2) Habits of reflecting and learning from five PSI information sources: (a–c) patient claim decisions made by healthcare officials, (d) medical device incidents and (e) objections submitted directly to their healthcare unit.
(3) Utilization of Finnish PS guidebooks.

The questionnaire enquired whether a special PSI-reporting system was used. Background information of the respondents was also gathered. Detailed response alternatives are given in Figures 1,2,3.

## Issues of confidentiality and ethics

AVIs in Finland are obligated to ensure that both public and private services in social and healthcare comply with legislation. They are also required to monitor the practitioners. Our research was

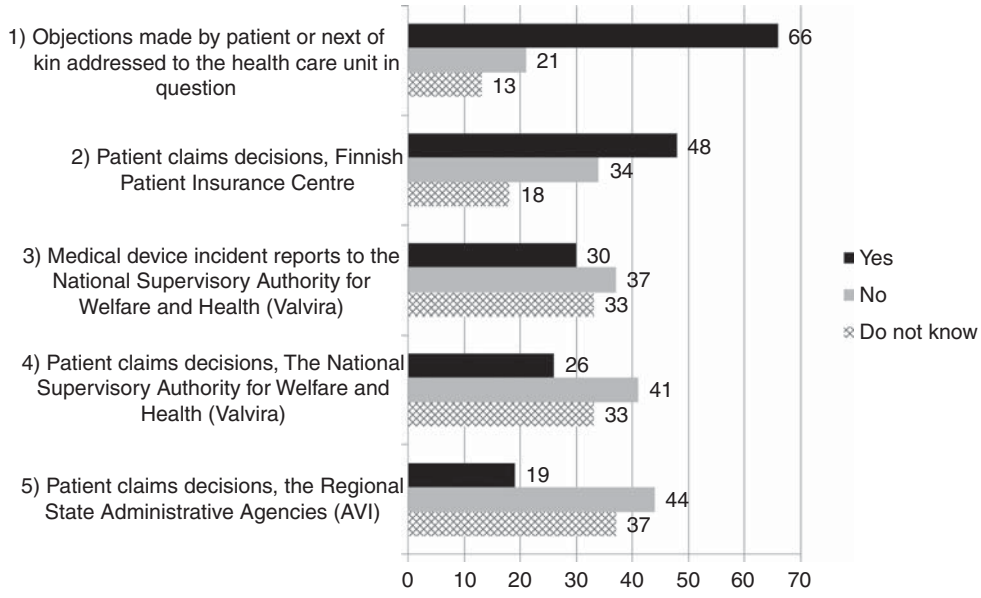


Figure 2. Reflection of PS data by Finnish dentists %, $n = 1013$. Multiple answers allowed.

conducted in the AVI of southern Finland and no research permit was needed. Respondents' answers were handled anonymously. The data was not and will not be used for disciplinary purposes. No identifying details were gathered of the patients concerned.

*Data analysis*

The data were exported to Excel and the Statistical Package for the Social Sciences (SPSS) 15.0 software for statistical analyses. Pearson chi-square tests ($\chi^2$) were first used to explore associations between the explanatory variables and reported PSIs. Because of possible confounders and intervariable effects, logistic regression was used to analyze association strength. We applied both univariate and multivariate models. $p$-values $< 0.05$ were considered to indicate statistical significance. Odds ratios (OR) of all classified incidents with 95% confidence limits are presented in the tables. Respondents' error prevention suggestions in the open-text answers were categorized according to the dental PSI-types most often reported [7]: i.e. diagnostics, treatment, equipment, devices and supplies , infection control, medication, communication and physical environment.

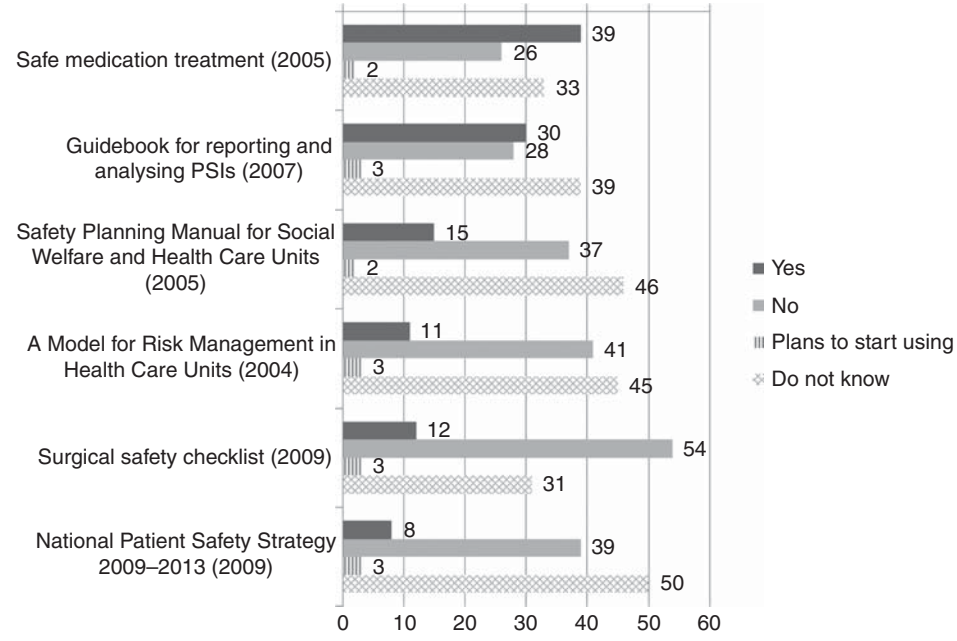


Figure 3. Utilization of national PS guidebooks by Finnish dentists %, $n = 1006$ (year of publication). Multiple answers allowed.

Table I. PSI prevention measures in dentists' open text responses.

| Type of PSI | Preventive method |
|---|---|
| All dental PSIs | Caution, forethought<br>Availability of correct patient information<br>Up-to-date medical and medication history of the patient<br>PSI reporting and analyzing<br>PS education to all dental staff<br>Knowledge and competence to deal with medical emergencies<br>Knowledge of when to consult or refer<br>Promotion of safe working conditions<br>Computer programs providing assistance in ensuring patient safety<br>Adequate language skills of staff |
| Diagnostics and dental treatments | The correct patient, procedure and site verified before diagnostic procedure or treatment<br>Using appropriate protective wear for patients (bib, protective eyewear, lip and cheek retractor, cotton rolls, rubber dam, radiation protection, cotton pliers for grasping objects from the oral cavity and dental suction to prevent ingestion/aspiration of foreign objects)<br>Good knowledge of anatomy and safe treatment techniques<br>Knowledge of managing and treating common complications |
| Equipment and devices | Double checking (e.g. the bur to prevent shearing off during use)<br>Correct equipment for the treatment<br>Safe design of equipment, devices and supplies<br>Adequate servicing and maintenance<br>Adequate training for users |
| Infection control | Appropriate decontamination procedures, hand hygiene and use of personal protective wear, durable gloves |
| Medication | Checking for possible drug interactions and drug allergies<br>Informing patients of connections existing between oral health and general health |
| Communication | Accurate patient records<br>Verbal and written patient information, obtaining informed consent |
| PSIs related to the physical environment | Safe design of dental facilities, e.g. prevention of patient falls |

## Results

### *Participant characteristics*

A total of 1041 dentists (response rate 54%) answered the questionnaire. Of the respondents, 71% were female ($n$ = 709), 29% were male ($n$ = 296), 56% mainly worked in public sector ($n$ = 571), 43% in private sector ($n$ = 445) and 1% worked elsewhere ($n$ = 13). Most respondents were general dental practitioners (GDPs) (83%, $n$ = 853) and more than half came from southern Finland ($n$ = 560). Most respondents worked with a dental assistant (96%). Background information of the respondents and the type and prevalence of PSIs are described in our previous article [7].

### *PSI prevention measures*

Many dental PSIs were reportedly preventable. Several narratives ($n$ = 452, 52% of all PSIs) contained suggestions for future prevention (Table I). Five most frequently reported PSI prevention measures included working with caution and forethought ($n$ = 101), keeping accurate patient records and the availability of correct patient information ($n$ = 92), appropriate protective wear/equipment for patients ($n$ = 50), safe working conditions (enough time and staff, minimizing distractions, good ergonomics and visibility and using the four-hand system with the dental assistant) ($n$ = 41) and obtaining thorough medical history and current medication information of the patient ($n$ = 31).

### *Discussing PSIs*

Most dentists (71%) reported having received some social support after the occurrence of a PSI. Most commonly they talked with their dental assistant (80%) and approximately half discussed the incidents at work unit meetings (53%) or with their supervisor (49%). Peer support from colleagues was received by a minority of respondents (40%) (Figure 1).

*Feedback and learning from errors*. Two-thirds of respondents reflected on objections made by patients or next of kin that were addressed to the healthcare unit in question. Nearly half discussed patient injury claims decisions by the FPIC at their work unit; significant variation between dentists working in different organizations existed however. Dentists working for private firms providing staff to public care reported especially rarely to have reflected on

these claims (19%), while especially many (67%) dentists working for the FSHS providing public oral healthcare for undergraduate students of, e.g. universities, reported having reflected on the claims $p < 0.001$. Less than one-third of the respondents reflected on the mandatory equipment incident reports made to health officials (Figure 2). Claims decisions made by Valvira were reflected at office-meetings by 26% of respondents, while 19% reflected on claims decisions made by AVI. Wide variations between dentists from different organizations existed. Dentists working in hospitals most actively reflected on these claims (Valvira, AVI) (42%) $p = 0.02$ and (45%) $p = 0.02$, respectively.

*Utilization of current national PS guidebooks*

The most commonly used PS guidebooks in dental practices were 'the Guidance for Safe Medication' (39%) and 'the Guide for Reporting of PSIs' (30%). Yet most respondents (61–70%) did not utilize either or know if these guidebooks were used in their organization. Other PS guidebooks were utilized even more rarely (Figure 3). However, at least one of the six guidebooks was used at 52% ($n = 518$) of respondents' practices.

Guidebook utilization varied significantly across the studied organizations. Guidebooks were used more often in hospitals than in other organizations. Three guidebooks most commonly used by hospital dentists ($n = 31$) were 'Surgical Safety Checklist' (55%), 'Safe Medication Treatment' (45%) and 'PSI Reporting' (45%). Guidebooks were especially commonly not used by respondents from private firms providing staff to public care (70–96%) and by respondents from the FSHS (73–100%) ($p < 0.01$).

*PSI-reporting systems and practices*

Less than one-third of the surveyed dentists (31%) used some special PSI-reporting system at their unit and 7% planned to begin using such a system. The anonymous reporting system HaiPro [22] was used by 6% of respondents. The majority either did not have or did not know if such a reporting system was in use in their organization (63%). Some dentists used informal error logs ($n = 19$), recorded PSIs in patient records only ($n = 26$) or used organization-specific reporting policies ($n = 95$). Some dentists (7%, $n = 69$) reported lacking knowledge of risk management practices in their organization and 6% reported that such practices were non-existent ($n = 60$).

*PSI risks in relation to dentists' risk management practices*

Our logistic regression models contained variables for dentists' gender, age, specialization, solo/group practice and working sector (public/private), PSI discussion methods, reflection on PS data, the existence of a PSI-reporting system (yes/no) and utilization of PS guidebooks (yes/no). Our models showed that dentists rarely discussing PSI occurrences at their practice or with peers had a slightly higher risk for PSIs; however, the difference was statistically insignificant. Dentists reflecting on only a few (0–3 out of 5) PS-related data sources at their office meetings had a significantly higher risk for NMs (OR = 1.77, 95% CI = 1.02–3.09, $p = 0.04$) than dentists reflecting on several (≥4 out of 5) PS-related data sources. Respondents not using a reporting system had a slightly lower risk for PSIs, but the difference was statistically insignificant (Table II). Different models showed that the more guidebooks used at a dental practice lowered the risk for PSIs to some degree, although the difference was statistically insignificant.

## Discussion

Our study showed that Finnish dentists already use and know many PSI prevention techniques. However, a wide variation in risk management practices exists. Some dentists and organizations actively use PSI-reporting systems and discuss PSIs in audit meetings, while others may lack such practices altogether. PS guidebooks, many of which had been published several years before our survey, were not actively used or well-recognized by dentists. A minority of respondents used PSI-reporting systems.

*How to prevent dental PSIs?*

According to PS research in other healthcare sectors safety can be achieved by either preventing error, preventing injuries, practicing evidence-based or by designing systems that support the performance of healthcare practitioners [24]. We agree with Karsh et al. [24] that any of these alone is unlikely to be sufficient and our results suggest that a combination is needed.

Good examples of dental PSI prevention measures, such as PS policies [2,3] and dental care risk management plans [4], have been published in recent years. Several PS toolkits for healthcare providers are adaptable to dentistry [25,26], even though all are not directly attributable [5]. One must realize, however, that wide variations exist between countries in safety knowledge, attitudes and practices [27]. According to our results, wide variations in risk management practices also exist between individual dentists and organizations.

Our results indicate that active learning from patient claims and complaints and device incidents might prevent NMs. Discussing PSIs in team meetings and with other dental care providers can also effect in PSI prevention, although this result was not

Table II. Multivariate model[a] of the occurrence risk of patient safety incidents (PSIs) in relation to dentists' [b] risk management practices.

| | | PSI | | AE | | NM | |
|---|---|---|---|---|---|---|---|
| Explanatory variable | *n* | OR (95% CI) | *p* | OR (95% CI) | *p* | OR (95% CI) | *p* |
| *PSI discussion methods*[c] | | | | | | | |
| 3–4 methods | 282 | 1 | | 1 | | 1 | |
| 0–2 methods | 538 | 1.31 (0.93–1.84) | 0.12 | 1.19 (0.81–1.74) | 0.38 | 1.30 (0.89–1.90) | 0.18 |
| *Reflection of PS data*[d] | | | | | | | |
| 4–5 sources used | 134 | 1 | | 1 | | 1 | |
| 0–3 sources used | 686 | 1.42 (0.90–2.26) | 0.13 | 1.30 (0.76–2.20) | 0.34 | 1.77 (1.02–3.09) | 0.04 |
| *A PSI-reporting system* | | | | | | | |
| Yes | 257 | 1 | | 1 | | 1 | |
| No/Do not know/Being planned | 563 | 0.83 (0.58–1.18) | 0.29 | 0.80 (0.54–1.19) | 0.27 | 0.80 (0.53–1.15) | 0.21 |
| *≥1 PS guidebooks*[e] *used* | | | | | | | |
| Yes | 425 | 1 | | 1 | | 1 | |
| No/Do not know/Being planned | 395 | 0.79 (0.58–1.09) | 0.15 | 0.80 (0.56–1.15) | 0.24 | 0.92 (0.65–1.31) | 0.64 |

[a] Model adjusted for gender, age, specialization, solo/group practice and working sector (public/private).
[b] Dentists not clinically practicing ($n = 33$) were excluded.
[c] Discussing PSIs: (1) with dental assistant, (2) during work unit meetings, (3) with supervisor, (4) with peers.
[d] PS data included: (1–3) claims' decisions made by the Regional State Administrative Agencies, the National Supervisory Authority for Welfare and Health (Valvira) or the Finnish Patient Insurance Centre (FPIC), (4) Medical device incident reports to Valvira, (5) Objections made by patient or next of kin to the healthcare unit in question.
[e] See Figure 3.
PSI, Patient Safety Incident; AE, Adverse Event; NM, Near Miss; OR (95% CI), Odds Ratio with 95% confidence interval.

statistically significant. Martijn et al. [15] previously found that it is potentially unsafe to not have common briefings in dental practices.

Tsutsumi et al. [16] have concluded that enhanced support resources within the workplace could be effective in reducing adverse events. A minority of Finnish dentists (40%) received peer support when discussing PSIs. The result is better than with Finnish physicians, of which 25% received support from colleagues when discussing PSIs [28].

We agree with PS education recommendations [4,8,9] given to all dental staff in undergraduate and postgraduate curricula [1–3,14]. We also recommend that dental teams as whole actively use incident report decisions and patient-produced PS information (claims, complaints) at organizational levels to feed knowledge back to front line personnel. PS staff training has indeed been recommended to be carried out at audit meetings [16] and study groups [2].

Many dentists did not utilize national PS guidebooks. Safety guidebooks are important in building up a uniform PS culture. Their utilization is still a new phenomenon in Finnish healthcare, but guidebooks will probably prove their effects over time. Currently, however, there are no guidebooks focusing especially on dentistry.

Voluntary, anonymous PSI-reporting [2,4] and mandatory reporting [8] of certain incident types are also important tools in building up a PS culture. Anonymous reporting systems have recently been launched in Finland, but they are currently used by a minority of dentists. These dentists reported larger numbers of PSIs than dentists not using or not familiar with such systems. Although this result was not statistically significant, it could imply that the utilization of these systems raises the ability to recognize hazardous situations.

From 2013 onwards special PS plans will be required of all public healthcare settings in Finland. Private dental companies comprised of more than two dental units must deliver a self-assessment plan to health officials. These requirements will likely increase the levels of PS and risk management strategy knowledge among Finnish dentists.

### *PSI prevention in diagnostics and dental treatments*

Caution and forethought are important in PSI prevention according to Finnish dentists. The ability to recognize personal skills and knowledge of when to consult or refer [10] to an appropriate professional [29] are also necessary. Following accepted guidelines is equally important [3,30]. Verbal and written patient information and obtaining informed consent from the patient [11,29] or the next of a kin [3] are also recommended prevention methods. Dentists should also pre-operatively verify that emergency equipment is available [31].

To prevent treating the wrong patient or performing a wrong treatment/right treatment on the wrong

site/side, at least two patient identifiers should be used [3,5] and the correct patient, procedure and site verified [31,32] before diagnostic procedures or treatments are carried out. Adapting checklists designed especially for dental procedures [4,9,14,18,31,32] and process standardization [32,33] are recommended. Several dental PSIs in our study were preventable, had appropriate protective wear been systematically used for all patients (e.g. airway, tissue, eye and radiation protection).

Most dentists in Finland work with a dental assistant or in a group practice. Communication breakdowns are one of the main contributing factors for PSIs occurring in primary care [12], including dentistry [7,15,33]. Many dental PSIs could have been prevented with clear communication without a risk of misinterpretations. Dentists and the dental teams, therefore, also need training in safe communication techniques [9,18]. Completion of accurate records [3,10,14] and appropriate referrals [10,32] are also recommended in the literature as well as by our respondent dentists. Finnish dentists also suggested better computer programs and supportive tools for electronic health records designed to provide assistance in ensuring PS, which are also recommended by Martijn et al. [15].

### *Facilities, equipment and devices*

Dental facilities where actual treatment was not being given were involved in only a few PSIs in Finland [7]. However, designing safe facilities and building defenses, barriers and safeguards into the facility, equipment and processes can have a significant positive impact on human performance and patient outcomes [34].

Dental equipment and devices, however, were connected to one-third of all harm-causing incidents [7]. Finnish dentists suggested adequate training for users and following manufacturer's instructions. Literature also recommends recording audits performed to survey unwanted effects [14,35] and regular inspecting, testing, servicing and maintaining [3,14,35] of all equipment.

### *Infection control*

Only a few PSIs reported in Finland were connected to infection control [7]. Appropriate infection control policies [3,14], hand hygiene and use of personal protective wear are vital for disease prevention.

### *Medication*

Some dental PSIs were caused by missing information concerning patient's medications [7]. Up-to-date medical and medication history of the patient [3,10,14,29,31] are important factors in dental PSI prevention. According to our results, systematic checks of possible drug interactions and drug allergies would have prevented some dental PSIs. Finnish dentists suggested informing patients about connections between oral and general health and the importance of telling their dentist about their medical conditions and all medications. Also Wilson and Sheikh [12] recommend educating patients and ensuring all healthcare sectors are aware if a patient is taking drugs associated with risk of iatrogenic harm (e.g. warfarin, immunosuppressants).

## Conclusions

Many PSI-prevention measures have already been implemented into Finnish dentistry practices, but there is need for increased awareness amongst Finnish dentists about various PS aspects. Chief dental officers have a central role in raising staff awareness of these issues. Many dental PSIs could be prevented or the degree of patient harm minimized, if available preventive techniques were systematically implemented to all dental practices. To stimulate dental PS policy development in all dental care units of all sizes, anonymous incident reports, patient complaints and claims data should be more actively used to aid mutual learning in extra-organizational networks both nationally and internationally.

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