

# Patient safety in domiciliary dental care for elderly nursing home residents in Sweden

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**Objective:** To analyse patient safety in domiciliary dental care, with data from a quality registry. **Design:** Retrospective analysis. **Clinical setting:** Domiciliary dental care, private caregiver, Sweden, 2012–2014. **Methods:** All reported events in the quality registry at a provider of domiciliary dental care, (2012-05-01 to 2014-06-30) were categorized into 14 domains, and for severity as ‘minor’, ‘moderate’, or ‘serious’ events. The reported events were also independently assessed by an experienced reviewer for national requirements of reporting patient safety related events. **Results:** The quality registry covered 724 (0.03%) reported events during 218,586 consecutive treatment sessions in domiciliary dental care, including 628,070 registered dental procedures. Fifty (6.9%) of the reported events were patient safety related, of which 11 (1.5%) events were reportedly of minor severity, 20 (2.8%) as moderate, and 19 (2.6%) as serious. For all degrees of severity, the most frequently reported events were related to problems with patient identity control (3.3%). None of the events required reporting to national authorities. **Conclusions:** Domiciliary dental care has a low frequency of patient safety related events (0.03% of all treatments). Identity controls need to be emphasised in nursing homes or where individuals are dependent on the care of others.

**Key words:** aged, dentistry, domiciliary care, geriatric dentistry, patient safety, nursing homes, Sweden

## Introduction

The elderly population in Europe and Sweden is increasing in numbers and life expectancy (European Commission, 2012). Consequently the societal cost of dental care for elderly is expected to increase substantially during the next decades (Petersen *et al.*, 2010). As in many other developed countries the improved dental status in Sweden has resulted in most of the elderly retaining their natural teeth relatively intact into greater age, often in combination with dental restorations or prosthetics (Petersen *et al.*, 2010). Morbidity, hospitalization and/or dependence on the care of others are known risk factors for deterioration of oral health, and prevalent among elderly nursing home residents (Terezakis *et al.*, 2011). In Sweden, elderly nursing home residents are entitled to a free annual oral health assessment (screening) and to limited dental care for the same fixed patient fee as in outpatient health care clinics (Swedish law, 1998), with a total yearly maximum cost of 1,100 SEK (91 GBP). Other groups entitled to limited dental care are the home dwelling elderly needing significant personal assistance, those with mental or functional limitations, and all receiving advanced medical home care. Traditionally dental care for these individuals has been offered at fixed dental clinics, but for several years domiciliary dental care is an emerging alternative (Komulainen *et al.*, 2012; Sjögren *et al.*, 2010). In Sweden, concerns have been raised over patient safety during domiciliary dental care, and so to what extent it should be subsidized by county councils. Both fixed dental clinics and, like other home care services, domiciliary dental care services

need to expand their protocols to encompass concerns for patient care, unnecessary harm to family caregivers and unnecessary disruptions to home care activities (Smucker *et al.*, 2014).

Domiciliary dental care is care carried out in a patient’s residence, typically residential and nursing homes, long-stay hospitals and private homes. Its objective is to deliver appropriate care to patients whose circumstances make it impossible, unreasonable or otherwise impractical to receive dental care at a fixed clinic, a hospital site or a mobile dental clinic (BSDH, 2009).

To our knowledge there are no previously published reports of patient safety in domiciliary dental care. Therefore, the aim was to analyse the patient safety of dental care, with data derived from a quality registry of the largest provider of Swedish domiciliary dental care.

## Methods

The data consisted of all events consecutively reported into a computerized quality registry system (Qulan, Preventum, Kungsör, Sweden) during routine dental care by a provider of domiciliary dental care (Oral Care AB, Stockholm, Sweden), throughout May 2012 to the end of June 2014 in six Swedish counties (Stockholm, Sörmland, Region Halland, Region Skåne, Region Västra Götaland and Östergötland). The employees in the different counties were trained by the same educators to standardise the reporting of events. Clinicians also received continuous feed-back from the management about reported events and required actions taken.

**Table 1.** Patient demographics (n=39,110) when the registry data were compiled (30 June 2014)

	<i>Female</i>		<i>Male</i>		<i>Total</i>	
Patients, n (%)	26,767	(68.4)	12,353	(31.6)	39,110	(100)
Age, years, mean (SD)	87.8	(7.7)	84.1	(8.9)	86.8	(8.3)
Time as patient, months, mean (SD)	19.8	(17.0)	17.5	(16.1)	19.1	(16.8)
Remaining, natural teeth, mean (SD)	14.2	(9.9)	15.1	(10.1)	14.5	(10.0)
Decayed teeth <sup>1</sup> , mean (SD)	1.5	(2.5)	1.9	(3.1)	1.6	(2.7)
Decayed root remnants, mean (SD)	1.3	(2.6)	1.8	(3.2)	1.5	(2.8)

<sup>1</sup> Includes only cavities within dentin and that could be registered by visual inspection, not initial/enamel caries lesions (i.e.  $\geq$ d3). If edentulous individuals are excluded, decayed teeth constitute 25.6% of the existing teeth.

All events were extracted from the database and categorized into 14 domains: ‘Administration’, ‘Dental laboratory’, ‘Dental materials’, ‘Diagnostics and treatment plan’, ‘Drugs’, ‘Equipment and other materials’, ‘Excellence (very positive remark)’, ‘External contacts’, ‘IT-related’, ‘Patient complaint’, ‘Patient safety related’, ‘Sharps injuries’, ‘Workplace and staff’, and ‘Others’ (i.e. non-systematic miscellaneous events, e.g. employee dissatisfaction related to colleagues, nursing homes, other dental caregivers, or dental laboratory, and reports on aggressive behaviour from patients with dementia or traffic accidents/incidents). The events were also categorised by severity as ‘minor’, ‘moderate’, or ‘serious’ events. A serious event was defined as one when a systematic chain of procedures or a single procedure, either directly caused or were at great risk to cause mental or physical permanent harm to patients, and also that the event was both preventable and predictable, caused by lack of professional knowledge or non-compliance to established procedures. A moderate event was one when a systematic chain of procedures or a single procedure, either directly caused or was at great risk of causing a mental or physical permanent harm to patients and that also was to a large extent preventable. A minor event was when a systematic chain of procedures or a single procedure, either directly caused or where at risk of causing a mental or physical temporary discomfort to patients. One of the authors (NB) participated as an independent expert who reviewed a vast majority of the patient related events, and calibrated two of the authors (MZ, PS) to the legal requirements for reporting of patient safety related events to national authorities.

Domiciliary dental care was conducted almost exclusively at nursing homes or largely similar care facilities, in the patients’ own room, with the patient lying in bed or sitting comfortably in a chair, or in a wheel chair. The treatment range was restricted and excluded surgical procedures (except for dental extractions), endodontic treatments and fixed prosthodontics. Depending on the treatment, the equipment could include: a portable dental unit (air rotor with light, micro-motor with light, ultrasonic scaler, LED light-curing lamp, three-function syringe, and suction unit), a rechargeable micro-motor unit, a portable dental x-ray generator, as well as necessary dental instruments, local anaesthetics, syringes and restorative materials, disposables, etc.

Patients who needed more advanced treatments or treatments that could not be carried out in domiciliary setting, or specialist care, were referred to a fixed clinic (around 600 referrals per year).

Ethical approval was not deemed necessary since data were collected retrospectively from a quality registry and did not include any information about individual patients. The register data were used for descriptive and hypothesis generating purposes, thus statistical inference was not attempted. Numbers needed to harm were calculated to demonstrate the number of treatment sessions needed for one event to be reported to the quality system, overall and for patient safety related events.

## Results

The patient population (n=39,110), based on patient charts when the registry data was compiled (30 June 2014) had a mean age of 86.8 (SD 8.3) years, and were predominantly women (68.4%), and had a mean of 14.5 (SD 10.0) remaining natural teeth (Table 1). The quality registry covered 724 reported events from 218,586 consecutive domiciliary treatment sessions (visits). Of the 628,070 procedures registered in patients’ charts, 51,889 were oral health assessments and 576,181 dental check-ups and treatments.

Some 30% of the sessions were performed by dentists, and 70% by dental hygienists (roughly reflecting the proportions of caregiver’s employed professionals). Check-ups, diagnostic procedures including oral health assessments, and preventive dental procedures, accounted for >80% of all procedures. Dental emergency related procedures, and tooth restorations accounted for about 8% and 10% of the procedures, respectively.

The 724 reported events from the quality register were divided into 14 domains. Most often events were in the ‘Administration’ and ‘Diagnostics and treatment plan’ domains, each contributing 19% of events (Table 2).

Fifty (6.9%) of the reported events were patient safety related, of which 11 (1.5%) events were reportedly of minor severity, 20 (2.8%) as moderate, and 19 (2.6%) as serious (Tables 2 and 3). Serious patient safety related events were most commonly related to patient identity control (n=10) with other domains contributing one or two events (Table 3). None of the reported events were serious enough to be reportable to national authorities. Across all degrees of severity, the most frequent patient safety related events were related to problems with patient identity control, accounting for 3.3% of all reported events and for 48% of patient safety related events.

Overall there were 302 treatment sessions per reported event (number needed to harm, NNH), meaning that a reported event occurred in 0.33% of treatment sessions. For patient safety related events the NNH was 4,272 treatments per reported event (0.02% of treatment sessions), and for patient identity control the NNH was 9,108 (i.e. 0.01% of treatment sessions).

**Table 2.** Number and proportion of events (n=724) according to domain and severity, for 218,586 consecutive treatment sessions in domiciliary dental care between 1 May 2012 and 30 June 2014

Domain	Number of events					Proportion (%) of events				
	Minor	Moderate	Serious	Excellent	Total	Minor	Moderate	Serious	Excellent	Total
Administration	87	43	8	0	138	12	6	1	0	19
Dental laboratory	18	20	4	1	43	2	3	1	0	6
Dental materials	1	2	0	0	3	0	0	0	0	0
Diagnostics, treatment plan	85	43	9	0	137	12	6	1	0	19
Drugs	6	2	3	0	11	1	0	0	0	2
Equipment and other materials	32	7	4	0	43	4	1	1	0	6
Excellence (positive remark) <sup>1</sup>	0	0	0	4	4	0	0	0	1	1
External contacts	27	22	2	0	51	4	3	0	0	7
IT-related	30	4	0	0	34	4	1	0	0	5
Patient complaint	23	12	7	0	42	3	2	1	0	6
Patient safety related	11	20	19	0	50	2	3	3	0	7
Sharps injuries	9	2	1	0	12	1	0	0	0	2
Workplace, staff	51	16	4	1	72	7	2	1	0	10
Other miscellaneous events <sup>2</sup>	44	31	9	0	84	6	4	1	0	12
Total	424	224	70	6	724	59	31	10	1	100

<sup>1</sup> Reported as an extraordinarily positive event.

<sup>2</sup> Included: employee dissatisfaction related to colleagues, nursing homes, other dental caregivers, dental laboratory, or communication problems, and reports on aggressive behaviour from patients with dementia or traffic accidents/incidents

**Table 3.** Number and proportion of patient safety related events (n=50) by category and severity, for 218,586 consecutive treatment sessions between 1 May 2012 and 30 June 2014

Category	Number of events					Proportion (%) of events				
	Minor	Moderate	Serious	Excellent	n	Minor	Moderate	Serious	Excellent	n
Booking services	1	5	1	0	7	2	10	2	0	14
Diagnostics	0	0	1	0	1	0	0	2	0	2
Identity control	5	9	10	0	24	10	18	20	0	48
Med tech equipment	0	0	2	0	2	0	0	4	0	4
Other care giver <sup>1</sup>	0	0	2	0	2	0	0	4	0	4
Patient records	2	2	0	0	4	4	4	0	0	8
Patient vs. personnel relation	0	1	0	0	1	0	2	0	0	2
Professional secrecy	0	1	2	0	3	0	2	4	0	6
Trauma - patient fall	1	1	1	0	3	2	2	2	0	6
Trauma - superficial wound	1	0	0	0	1	2	0	0	0	2
Treatment error	1	0	0	0	1	2	0	0	0	2
Treatment results	0	1	0	0	1	0	2	0	0	2
Total	11	20	19	0	50	22	40	38	0	100

<sup>1</sup> Reported events considered practice of another care provider.

## Discussion

From 218,586 consecutive Swedish domiciliary dental care treatment sessions with 724 (0.03%) reported events there was a low frequency of patient safety related events. There were 4,272 treatment sessions per such reported event. However, among the patient safety related events, the most frequently reported ones involved patient identity control (3.3%). There were no serious events requiring reporting to national authorities.

To avoid the risk of missing any serious patient safety related events, it was considered important to include all consecutive treatment sessions. The data is considered representative for elderly nursing home residents in Sweden, since it were collected on a daily basis in routine domiciliary dental care over more than two years across six counties including the three largest cities and both

urban and rural areas. No data regarding the technical quality of the dental care were analysed though clinical audits are continuously carried out by the caregiver. So, the low frequency of complications and adverse events show that this domiciliary dental care should be considered patient safe.

The patient misidentification problems, especially at nursing homes, are associated with risks of treating the wrong individual and consequently not treating the patient in need. Strict identification protocols need to be emphasised in settings where individuals are dependent on the care of others and/or may suffer from cognitive impairments. Within the studied care provider organization, these routines were corrected by requiring the dental staff to verify the patient identity by more than one source of information (e.g. nursing staff knowledge and id-card) whenever possible.

A recent Swedish study concluded that domiciliary dental care for elderly nursing home residents is cost-effective at the societal level compared to dental care at fixed clinics, and that alternative methods to deliver dental care should be made available in order to meet the needs for oral health care in the ageing population (Lundqvist *et al.*, 2015). In a Finnish study one out of four home-dwelling older people preferred a dentist visit at home rather than a visit to a conventional (fixed) clinic and this preference was associated with impaired cognitive function, reduced capacity for activities of daily living, living alone and use of home care services (Komulainen *et al.*, 2012). Therefore, it is plausible that among elderly nursing home residents an even higher proportion would prefer domiciliary dental care ahead of transport to a fixed dental clinic.

A limitation with the current study is that the data were collected during routine practice and retrospectively analysed. In case-series and registry data there are potential sources of bias related to external validity (mainly related to selection of eligible cases), study limitations (e.g. blinding and follow-up) and precision (especially in small series). However, in this case the large number of employees registering the events across more than 200,000 treatment sessions contributes to a regression towards the mean, which reduces the impact of inter-observer variability and increases the reliability of the reported data.

During the period in which these data were collected it became evident that reporting of event to a quality registry was perceived as somewhat demanding by some of the dental staff and on the introduction of the quality reporting system many trivial and irrelevant events were reported. Re-calibration and re-education of the staff was undertaken after a few months. The quality registry also revealed previously undiscovered problems (e.g. with identity control, booking services, and diagnostics) that could be corrected with improvement of routines and education. The effect of these improvements can also be followed up and re-evaluated using data from the system.

Industries such as aviation (Ferroff *et al.*, 2012), nuclear energy (Lee and Harrison, 2000), pharmaceutical industry (Lewis *et al.*, 2013), and medical care organisations (McFadyen *et al.*, 2015), are using quality systems in their practice standards and safety programs. However, in dental practice these kinds of systems are often poorly utilized for continuing development of the profession. In addition to registration and subsequent improvement of patient safety related events organizational aspects of service delivery also need to be integrated into a quality system (Goetz *et al.*, 2014). In geriatric dental care this is especially important, also from an ethical point of view, since many of the patients are physically and cognitively compromised, and relatives or other care givers may need to participate in treatment decisions (Clarke *et al.*, 2013).

Quality in health care is often defined in terms of patient safety, clinical effectiveness and patient experiences (Mills *et al.*, 2014). Thus, health care should be patient-centred and it should be ensured that individual patient needs, values and preferences guide all clinical decisions, (Dowse, 2015), but recent systematic review noted that published research on patient-centred care within dentistry is limited and does not relate to general dental practice (Mills *et al.*, 2014).

From a patient safety perspective, the main advantage of a fixed dental clinic is that all dental equipment is available. In domiciliary dental care the care that can be provided is partly limited and the working environment may occasionally be more difficult for the dental staff. The mobile dental equipment should meet the requirements for that working environment and for hygiene and quality standards. Domiciliary care is demanding of dental staffs' skills to work hygienically, and the treatment level should be adapted to the available equipment and the patients' ability to cooperate. Consequences of complications related to more advanced medical (dental) devices are potentially more hazardous. Thus, from a patient safety point of view, it seems reasonable to conduct the more advanced treatments, such as surgical procedures and root canal treatments, at a fixed clinic. Although limitations associated with domiciliary care should be balanced against the risk of not providing access to dental care at all, especially for patients who cannot easily be transported to a fixed dental clinic.

With the new perspective in mind, improved dental status in the adult population where most of the elderly retain most of their natural teeth, an important question is whether the current dental care systems are appropriate for present and predicted levels of oral diseases in elderly frail populations. Further studies are needed to fill the vast knowledge gaps on how dental care should be best provided to vulnerable groups. Therefore, we intend to follow-up this study by evaluating how event reporting can best be used in quality development of domiciliary dental care.

Domiciliary dental care has a low frequency of patient safety related events and should be provided to elderly in order to improve accessibility to dental care. Identity controls need to be emphasised in nursing homes or similar where individuals are dependent on the care of others.

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