The oral health status of older patients in acute care on admission and Day 7 in two Australian hospitals

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Abstract

Objective: to determine the oral health status of older patients in acute care wards at admission and after 7 days.
Methods: a prospective descriptive study was conducted in two acute tertiary referral hospitals in New South Wales, Australia. Oral health was assessed on admission (within 24 h) and Day 7 using the Oral Health Assessment Tool.
Results: a total of 575 patients were admitted under the Geriatric teams at the two hospitals. Four hundred and thirty-five (76%) patients had oral cleanliness (debris) scores in the 'not healthy' range with food particles, tartar or plaque evident in at least one area in most areas of the mouth, teeth or dentures. At Day 7 206 were reassessed. One hundred and forty-nine patients (73%) were in the 'not healthy' range and of these 127 (62%) had the same score as on admission.
Conclusion: poor oral health is common in older people admitted to hospital acute care wards and does not improve over a 7-day period. Given the link between oral health and general health the next steps are to determine how oral health can be improved in this setting and see whether this leads to better patient outcomes.

Keywords: *Oral health, Aged 80 and over, Frail older inpatients, Older people*

Background

In the acute hospital setting older patients are likely to be at risk of poor oral hygiene as a result of their acute medical illnesses, delirium and pre-existing medical problems all of which compromises their ability to attend to their oral hygiene [1–3].

If left untreated, poor oral hygiene could lead to aspiration of bacteria from the oral cavity into the lungs and potentially increases the risk of hospital acquired pneumonia [4–6].

Previous studies have described the oral health of older inpatients in the acute hospital within a few days of admission [7–9]. However, there has not been any study that describes the changes that occur in oral health during patients' in-hospital stay.

The purpose of this study was to determine oral health status of older patients on admission to acute hospital wards and to identify what changes to oral health occurred in the week following admission. There is evidence that better oral health care can decrease episodes of pneumonia in a nursing home population [10]. If interventions to improve hospitalised patients oral health are to be studied and implemented it is important to have an understanding of the oral health status of this group of patients and know how it changes over time in the context of current acute ward practices.

Methods and materials

The study was an observational study conducted at two acute tertiary referral hospitals in Sydney, Concord Repatriation General Hospital (CRGH) and Nepean Hospital (NH). All patients admitted via the Emergency Department, under the care of a Geriatrician were included. The study was conducted over a 4-month period at each site and only consecutive patients admitted from Sunday to Wednesday were included due to the work schedule of the primary data collector.

The Oral Health Assessment Tool (OHAT) [11], a screening tool suitable for an older care population, was used to determine oral health status. Within 24 h of admission and at Day 7 (if still an inpatient) the OHAT was administered by a trained observer (JG), between 8 a.m. and 10 a.m. in a standardised way.

The OHAT comprises eight components: lips, tongue, gums and tissues, saliva, teeth, dentures, oral cleanliness and dental (mouth) pain. See Appendix 1 in the supplementary data, available at *Age and Ageing* online (http://www.ageing.oxfordjournals.org/). The OHAT scores range from '0' (healthy), '1' changes from normal appearance and '2' unhealthy. To administer the OHAT the oral cavity of the patient was inspected for approximately 5–10 min. Of the 8 OHAT components, 'oral cleanliness' at Days 1 and 7 was the primary outcomes of interest as this may change over a 7-day period. Total OHAT scores were derived from the sum of the eight components scores (minimum score of 0 and a maximum possible score of 16).

Information was collected on the patient's age, gender, living arrangements, medical history and admission diagnoses from the medical records. The only information obtained directly from patient and/or carers was about when they were last seen by a dentist.

Preadmission activities of daily living status and co-morbidity was assessed using the Katz ADL tool [12] and Charlson Co-morbidity Index [13] respectively.

The study was approved by the Sydney Local Health District CRGH Human Research Ethics Committee (HREC/12/CRGH/201 CH62/6/2012–156).

Data analysis

Data analysis was conducted using SPSS 20 for Windows. Initial analysis of the OHAT scores (0 = healthy, 1 = changes, 2 = unhealthy) for 6 of the 8 individual OHAT components revealed that only a few patients were categorised as 'unhealthy' but many were categorised as 'changes'. The term 'change' in the OHAT indicates an observation that the domain is not normal, but does not appear to require immediate intervention by a dental professional. The 'unhealthy' category implies dental treatment or consultation is needed. The 'unhealthy' and 'changes' categories were therefore combined to create a 'not healthy' category for each OHAT category. McNemar's test were used to determine if there were significant differences in the proportions who were 'healthy' versus 'not healthy' on OHAT components at Day 1 compared with Day 7.

In the patients who were seen at the two points in time, the proportion that remained and moved between 'healthy' and 'not healthy' categories was analysed. Patients were categorised into four groups: (A) healthy Day 1 to not healthy Day 7, (B) healthy Day 1 to healthy Day 7, (C) not healthy Day 1 to not healthy Day 7 and (D) not healthy Day 1 to healthy Day 7.

To determine patient related factors associated with poor overall oral health status on admission, at Day 7 and change in total OHAT score from admission to Day 7; univariable and multivariable analyses were conducted with admission total OHAT scores (n = 575), Day 7 total OHAT score (n = 206) and change in total OHAT score from Day 1 to Day 7 as dependent variables in separate models.

Sample size

The study required 200 pairs of Day 1 and Day 7 observations, for 99% power to find a significant difference (0.05) in the proportions assuming 5% worsen on their OHAT scores and 20% improve.

Results

Demographics and clinical characteristics of patients

A total of 575 (88.6%) patients out of 649 patients were seen across the two sites (see Table 1). At CRGH (n = 187; 32.5%) and at NH (n = 388; 67.5%). Two hundred and six patients still in hospital at Day 7 were reassessed: CRGH (n = 103) and NH (n = 103). Seventy-four (11.7%) of patients were not seen on Day 1 for the following reasons: verbal or physical behaviours (n = 7), receiving palliative care (n = 3), deemed inappropriate by the medical team (n = 11), not seen within 24 h of admission (n = 23), not on the ward secondary to a procedure (n = 10), or transferred to another ward/hospital (n = 11), early discharge (n = 8), or died (n = 1).

The mean age of patients seen at Day 1 was 84.1 years (SD = 7.5) and of these 343 (59.7%) were female. The majority of patients 405 (70.4%) were from home or an independent living unit. The median length of stay was 6 days (interquartile range 2.0–10.0).

The majority of patients (n = 425, 73.9%) had a Charlson Co-morbidity Score that ranged between 0 and 3. Patients ranged from requiring assistance for all activities for daily living (Katz ADL score of '0') to independent for all their ADL's.

Of those individuals (n = 397) who reported they had seen a dentist, 285 (71.8%) had not seen a dentist for 13 months or more.

Table 1. Demographic and clinical characteristics of patients

Characteristics n = 575	n (%)
Age	
65–75	72 (12.5)
76–85	221 (38.4)
86–95	188 (32.7)
96+	94 (16.3)
Residence	
Home & retirement village	405 (70.4)
Hostel & nursing home	170 (29.6)
Gender	
Female	343 (59.7)
Male	232 (40.3)
Admission diagnosis n = 575	
Confusion/delirium	85 (14.8)
Falls/injury	144 (25.0)
Immobility	41 (7.1)
Infection	93 (16.2)
Cardiac/respiratory	138 (24.0)
Other	235 (40.9)
Pre-morbid medical history	
Neurological	
Dementia	161 (28.0)
Parkinsons	29 (5.0)
Stroke	95 (16.5)
Other neuro	148 (25.8)
No. of chronic diseases	
0–3	191 (33.2)
4	119 (20.7)
5–6	176 (30.6)
7+	89 (15.5)
Charlson co-morbidities score	
Total CI score 0–3	425 (73.9)
Total CI score 4–5	105 (18.3)
Total CI score 6–7	28 (4.9)
Total CI score 8–12	17 (3.0)
ADL status score	
0 (Dependent)	128 (22.3)
1–2	76 (13.2)
3–5	96 (16.7)
6 (Independent)	275 (47.8)
OHAT total score (admission)	
Mean (SD)	4.0 (2.0)
Median (IQR)	4.0 (3.0–6.0)

Changes in OHAT categories from Day 1 to Day 7

Four hundred and thirty-five patients (76%) of the 575 seen at Day 1 had an oral cleanliness score categorised as 'not healthy' (see Table 2). For the sub-group of 206 patients who were in hospital at Day 7, 161 (78%) had an admission oral cleanliness score rated as 'not healthy', which decreased to 149 (72%) at Day 7. This difference was not statistically significant. On separation of the 'not healthy' group at Day 7 into its two sub-categories, 86 patients (42%) were in the 'changes' group with the remaining 63 (31%) in the 'unhealthy' group (data not shown). These proportions were similar at admission. As for the other OHAT components, a greater proportion of patients were categorised as 'healthy' at Day 7 in four components: lips, tongue, gums and tissues and saliva. No statistically

significant difference was found for teeth, dentures or mouth pain.

There were no significant differences in OHAT categories and total OHAT scores between patients seen only at Day 1 compared to Day 1 and Day 7 (data not shown). Delirium was a more common diagnosis in the sub-group seen at two points who also had worse ADL function (data not shown). There were no significant differences in any other characteristics.

Movement between oral health categories from Day 1 to Day 7

Appendix 5 shows how the 206 individuals seen on admission and Day 7 moved between the oral health categories over this time period. In the majority of cases (62%; n = 127) oral cleanliness remained 'not healthy'. In 22 patients (11%) oral cleanliness changed from 'healthy' to 'not healthy'. In 34 (16%) patients oral cleanliness improved from 'not healthy' to 'healthy', with 23 patients (11%) remaining 'healthy' at both time points. None of the demographic characteristics or clinical characteristics was significantly different between the four groups (data not shown). For the other OHAT components the majority remained unchanged, but a greater proportion than for oral cleanliness changed from unhealthy to healthy for lips, tongue, gums/tissue and saliva.

Characteristics that predict the overall oral health on admission based on the total OHAT score (n = 575)

Univariable analysis was conducted to determine the factors associated with total OHAT score on admission. A high OHAT score means that the patient had 'unhealthy' oral health. As a group, patients from nursing homes or hostels had significantly higher mean OHAT scores than those from community dwellings or retirement villages. Significantly higher mean OHAT scores were seen in males than females. Those who were dependent for all their ADLs had significantly higher mean scores than those who were independent; and significantly higher mean OHAT scores were seen for those admitted due to falls. Individual's with a pre-morbid history of dementia or Parkinson's disease were also found to have significantly higher mean OHAT scores on admission. In multivariable analyse; males, and those with a pre-morbid history of Parkinson's disease, were significantly associated with higher total OHAT score at admission. See the table Appendix 2 in the supplementary data, available at *Age and Ageing* online (http://www.ageing.oxfordjournals.org/).

Characteristics that predict overall oral health on Day 7 based on the total OHAT score Day 7 in 206 patients

Univariable analysis found characteristics that had strong associations with high mean OHAT Day 7 scores were: assistance with feeding, gender, residence (nursing home and hostel) and a history of spinal problems. Multivariable analysis found that being male, and a spinal history had strong

Table 2. Changes in OHAT categories from Day 1 to Day 7

OHAT category scores	All subjects baseline	Patient who remained in hospital for 7 or more days		
	Day 1 *n* (%) N = 575	Day 1 *n* (%) N = 206	Day 7 *n* (%) N = 206	P value[a]
Oral cleanliness[b]				0.141
0 = Not healthy	435 (75.7)	161 (78.2)	149 (72.3)	
1 = Healthy	139 (24.2)	45 (21.8)	57 (27.7)	
Lips				0.033
0 = Not healthy	430 (74.8)	151 (73.3)	133 (64.6)	
1 = Healthy	145 (25.2)	55 (26.7)	73 (35.4)	
Tongue				0.001
0 = Not healthy	382 (66.4)	134 (65.0)	95 (46.1)	
1 = Healthy	193 (33.6)	72 (35.0)	111 (53.9)	
Gums & tissues				0.004
0 = Not healthy	245 (42.6)	82 (39.8)	59 (28.6)	
1 = Healthy	330 (57.4)	124 (60.2)	147 (71.4)	
Saliva				<0.000
0 = Not healthy	294 (51.1)	109 (52.9)	73 (35.4)	
1 = Healthy	281 (48.9)	97 (47.1)	133 (64.6)	
Teeth	N = 358	N = 124		0.375
0 = Not healthy	188 (52.5)	68 (54.8)	65 (52.4)	
1 = Healthy	170 (47.5)	56 (45.2)	59 (47.6)	
Dentures	N = 340	N = 109		0.375
0 = Not healthy	25 (7.4)	9 (8.3)	6 (5.5)	
1 = Healthy	315 (92.6)	100 (91.7)	103 (94.5)	
Mouth pain[c]				0.143
0 = Not healthy	39 (6.8)	8 (3.9)	15 (7.3)	
1 = Healthy	535 (93.0)	198 (96.1)	191 (92.7)	

[a]McNemar Test.
[b,c]1 by missing from these categories (Ref 1609).

associations with high OHAT mean scores at Day 7. See the table Appendix 3 in the supplementary data, available at *Age and Ageing* online (http://www.ageing.oxfordjournals.org/).

Characteristics that predicted changes in overall oral health on Day 7 based on the difference between total OHAT score at baseline and Day 7

Place of residence (nursing home and hostel), length of stay and history of hypertension were significantly associated with change in overall OHAT score between baseline and Day 7. Multivariable analysis showed hypertension was the only characteristic that was significantly associated with a change in OHAT score from Day 1 to Day 7. See the table Appendix 4 in the supplementary data, available at *Age and Ageing* online (http://www.ageing.oxfordjournals.org/).

Discussion

Our study found oral cleanliness was 'not healthy' at the time of admission for the majority of older patients in acute hospital wards. This is consistent with previous studies that have assessed the oral health status of older patients on admission to an acute hospital [7–9, 14]. Further, given that 70% of individuals were from home or independent living units, the high level of unhealthy 'oral cleanliness' scores on admission are of concern. It infers that individual's regardless of living arrangements may not be undertaking appropriate oral care or be able to undertake it without support.

We found independence, or part independence, in ADL status scores was not predictive of better oral health in multivariable analyses. This may be attributable to a combination of general ageing and the subsequent impact of frailty on the individual due to chronic disease [1, 15, 16].

We found that oral cleanliness improved in only a few patients whose oral cleanliness was 'not healthy' on admission. Even in those 45 patients who had 'healthy' oral cleanliness on admission, oral cleanliness deteriorated to the 'unhealthy' category in 22 patients (49%) by Day 7.

Previous studies of nurses oral health activities shows ward nurses face barriers when attempting to deliver oral hygiene. An earlier study, conducted at the same hospitals found the main barriers were: patient 'care resistive behaviours', lack of staff and patient physical difficulties [17].

Our results showed at Day 7 the majority of patients (62%) oral cleanliness remained at their admission status, at the 'not healthy' end of the scale. As oral cleanliness comprises food debris, tartar and plaque build up, it would be assumed that this could improve during the hospitalisation if consistent oral care such as tooth and denture brushing were undertaken. Our results suggest that efficient removal of oral debris may be difficult for patients and nurses to do in hospitals.

Oral cleanliness was used as the main outcome measure as it is likely to change over a 7-day period. Instead we found some improvements in the lips, tongue, saliva and gums and tissues OHAT categories. We hypothesise that this is due to medical treatment, such as hydration and nursing assisting with feeding, resulting in improved nutrition. It was not surprising to find little change in tooth condition, dentures or mouth discomfort as no dental interventions were conducted during this period.

An objective of our study was to identify characteristics that could predict poor oral health on admission and also predict those patients who were at higher risk of deterioration in oral health. When adjusting for medical characteristics and clinical features – being male was associated with higher OHAT scores at admission and Day 7. We did not find any other clear demographic or clinical characteristics that predicted OHAT change group (healthy to unhealthy or vice versa) or change in total OHAT score (apart from a history of hypertension). Given the range of demographic and clinical characteristics as seen in our study, it would be better to implement strategies to improve oral health on a whole ward basis. All patients should be targeted rather than trying to identify patients at greater risk of poor oral health or deterioration in oral health status.

Limitations of study

Assessment of oral cleanliness using the OHAT tool while being simple to use does have limitations. For example, if an individual ate food and did not complete oral hygiene

care prior to assessment, their score may be higher due to residual food residue in the oral cavity. In an effort to assess patients after their morning oral health care the researchers conducted assessments within a set time frame in the morning. Due to the constraints of an acute care ward it is acknowledged some patient's may not have had their oral hygiene completed, especially in patients dependent for assistance. Subsequently, their score may be higher due to residual food residue in the mouth.

Conclusions

Our study found a large proportion of older people on admission to hospital have poor oral health. It did not improve in most people who remained in hospital for 7 days. Apart from gender, there were no clear demographic or clinical predictors of poor oral health or change in oral health. This suggests that it is better to provide oral health care support to all older patients in acute wards, rather than trying to target interventions to only a 'high-risk group'.

Key points

- 75% of older people on admission to an acute hospital have 'unhealthy' oral cleanliness.
- At Day 7, 62% of older people's oral cleanliness remains 'unhealthy'.
- Fifty per cent of individuals with 'healthy' oral cleanliness at admission deteriorated after a week.
- Oral care routines need to be developed that target all patients on the ward in this setting as there do not appear to be specific demographic or clinical characteristics that can be used to identify high-risk individuals or groups.

Supplementary data

Supplementary data are available at *Age and Ageing* online.

Conflicts of interest

None declared.

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