

# Association of urgent dental care with subjective oral health indicators and psychosocial impact

L Luzzi, K Jones, AJ Spencer and KF Roberts-Thomson

*Australian Research Centre for Population Oral Health, School of Dentistry, Faculty of Health Sciences, The University of Adelaide, South Australia 5005.*

Pressures on public dental services require new approaches to managing demand. **Objective:** To identify possible predictors of urgency of clinically assessed emergency dental care using self-reported oral health indicators. **Design and Methods:** This study was a prospective study examining associations between patient reports of oral health indicators and psychosocial impact of oral disorders and a clinical determination of a hierarchy of urgency of emergency dental care. The data set comprised a random sample of 839 eligible adults presenting to nine public dental clinics across South Australia and New South Wales for emergency dental care. All participants held a government health concession card and were aged 18+ years and had a minimum of six natural teeth. Significant associations between self-reported oral health indicators and psychosocial impacts and a normative clinical assessment of urgency of emergency dental care were examined by means of binary logistic regression analysis in order to develop prediction models. Prediction of the urgency of emergency dental care was based on the assessment of two models – Model 1: urgency of care = <48 hours vs. 2+ days, Model 2: urgency of care = 2–7 days vs. 8+ days. **Results:** Some 35.8%, 34.8% and 29.4% of respondents were classified by the assessing dentist as requiring dental care within 48 hours, 2–7 days and 8+ days respectively. For Model 1, difficulty sleeping all the time (OR=4.8, CI=3.0–8.0), pain in the jaw when opening wide (OR=2.4, CI=1.6–3.7), having a broken filling (OR=1.7, CI=1.1–2.4), having a loose tooth (OR=2.4, CI=1.5–3.8), bleeding gums (OR=0.7, CI=0.5–1.0) and being dentally anxious (OR=1.5, CI=1.0–2.3) had a statistically significant association with needing to be seen within 48 hours. For Model 2, factors significantly associated with an urgency of care in the period 2–7 days included experience of toothache (OR=2.6, CI=1.6–4.3), pain in teeth with hot food or fluids (1.9, CI=1.2–2.9), bleeding gums (OR=2.0, CI=1.3–3.2), having a broken filling (OR=2.1, CI=1.2–3.5), difficulty sleeping all the time (OR=2.9, CI=1.4–6.4), and being concerned about the appearance of teeth or mouth very often (OR=0.3, CI=0.1–0.7). **Conclusion:** This study has identified a pertinent set of self-reported oral health indicators that can be used to predict the urgency of emergency dental care.

*Key words:* Emergency dental care, priority, urgency

## Introduction

Oral diseases and conditions potentially produce many symptoms among individuals. These symptoms can cause physical, social and psychological effects that influence the individual's daily living and quality of life. Consequently, oral health is a multi-dimensional concept, considerably more than just a physical state of well-being; it also encompasses a psychosocial perspective. Traditional clinical indicators obtained through normative assessments measure disease rather than oral health and therefore represent a limited unidimensional aspect of oral health (Locker, 1988). Psychosocial aspects of oral health should therefore be taken into account in the determination of oral health and treatment need (Sheiham and Croog, 1981).

One measure, Locker's Subjective Oral Health Status Indicators (SOHSI), which consists of a battery of eight subjective indicators (Locker, 1997), was tested in Canada and the United Kingdom (UK) for its association with dental status. Locker and Jokovic (1996) reported on the ability of subjective indicators to predict examiner-assessed treatment needs among community-dwelling older adults who were interviewed and examined in a

health survey. Although there were significant associations between the subjective indicators and clinical measures, discriminant validity was low. However, the measures did identify a sub-group of individuals whose clinical conditions impacted on daily life among whom, the authors argued, dental treatment would have the greatest positive impact. In this respect, Locker and Jokovic (1996) suggested that the subjective measures could be interpreted as indicators of need which complement conventional clinical measures of need for dental care.

Tickle, Craven and Blinkhorn (1997) tested the performance of SOHSI in the UK. They examined the association between the subjective indicators and dentate status, satisfaction and assessment of oral health. SOHSI was found to be reliable and to have satisfactory construct and concurrent validity. Correlations between self-reported number of teeth and the subjective indicators confirmed the strength of the theoretical model underpinning SOHSI and provided further evidence of its content validity. Robinson *et al.* (1998) investigated whether questionnaires could be used as a substitute for clinical surveys in the assessment of dental treatment needs of adults by comparing lay perceptions of dental treatment need with normative assessments by a dental practitioner.

Although they found that self-reported interview data were not useful for assessing individual treatment need, the results of this research suggested that self-assessment might be useful in assessing, at a population level, the dental needs of adult communities.

These studies give some indication of the possible utility of subjective indicators as tools for assessing relative need or priority for dental care. Locker and Jokovic (1996) clearly described the potential to identify sub-groups in greater need for dental care. However, SOHSI has been used among older adults and there has been no analysis of associations with either professionally assessed need, clinical judgements on urgency or priority for dental care, or the actual patterns of service used or types of care subsequently provided in clinical settings. It was this context of a lack of evidence among adults in general and on the relationship with clinician's judgements and the process of dental care delivery that provided the background for this research. It was the prospect of the usefulness of subjective indicators as a means of ensuring the relative need for care among care seeking populations that provided the background for the present research.

Long dental waiting lists for general public dental care (Spencer, 2001) and the increased demand for emergency dental treatment has necessitated the development of a system of prioritisation for emergency dental care within the public dental system. Therefore, the purpose of this research was to contribute to the development of a mechanism to use self-reported oral health and psychosocial impact to assess the reasonableness of presentation for emergency care. 'Emergency' in this context had no formal or documented clinical definition. Instead, it was defined operationally, usually by reception staff, as people who were eligible for public dental care who contacted a dental clinic seeking an appointment for a specific problem usually involving the relief of dentally-related pain.

The aim of this study was to examine the association of patient subjective oral health indicators and psychosocial impacts of oral diseases and disorders with dentists' clinically assessed urgency for dental care.

## Methods

This study had a prospective design whereby self-reported oral health indicators were collected prior to patients being clinically examined and treated. Nine public dental clinics across South Australia (SA) and New South Wales (NSW) were involved. The criteria used to select participants were, that patients were indeed seeking emergency dental care (requests for emergency dental care were made either in person at the participating clinic or by telephone); that they held a current government health concession card; were aged 18 years or older; and were dentate with six or more natural teeth. Patients presenting with acute emergency dental needs (haemorrhage, trauma and/or facial swelling) were excluded as it was essential for these patients to be given priority and receive advice and/or treatment in a timely manner.

A random sample of patients seeking emergency care was selected at each clinic to permit selection of a manageable number of study participants in each working day.

As such, participants were recruited to the study using simple randomisation which was performed using a computer-generated randomisation list of the words 'In' and 'Out'. Potentially eligible patients contacting the clinic for emergency dental care were crossed off systematically down the list, with 'In' denoting inclusion into the study. The required sample size was calculated using the simple random sampling formula for a proportion. The sample size was calculated to achieve a design relative standard error of 2% on the proportion of patients presenting for emergency public dental care, which was estimated to be 80%. The sample size was then adjusted to allow for sample attrition. Consequently, a sample size of 920 (500 in SA and 420 in NSW) was targeted.

Participants completed a structured interview conducted by reception staff. Responses were entered onto an interview record form with pre-coded closed response categories. Participants were asked about their dental visiting behaviour, presence of any symptoms related to various oral diseases and disorders, psychosocial impact of various oral diseases and disorders, and socio-demographic characteristics. Following the structured interview, participants underwent a clinical examination. Assessing dentists recorded epidemiological measures that included coronal status and periodontal condition. The assessing dentist also provided a clinical judgement on the urgency of emergency dental care required. The clinical judgement was stratified into a hierarchy of urgency of care, i.e., urgency was measured on an ordinal scale represented by the categories <48 hours, 2–7 days, 8–13 days and 14+ days for emergency dental care. The assessing dentists based their judgement of urgency on their own clinical experience. For example, their judgement could have been based on what they considered to be a "dental-medical urgency" - e.g., to avoid hospitalisation, infection, tooth loss - or symptomatic e.g., to control/avoid pain. As no specific guidelines were used, assessing dentists were not trained and standardised in the way they assigned urgency categories to patients. All judgements were subjective and were approached in this manner in order to mimic the way public dental clinics functioned at the time. This was considered to be an appropriate real-world method of measuring urgency as dentists tend to differ on treatment decisions. Using such a subjective measure was thought to reflect the way dentists currently think in terms of their treatment philosophies and approach to providing dental care (Bader and Shugars, 1995, 1997). At the time of assessing patient urgency, the assessing dentists were unaware of the participants' responses to the structured interview.

Structured interview data and epidemiological data were collected, coded and entered as data files linked by unique identifiers. All participants provided signed consent for participation in the study.

The clinical assessment of 'urgency of care' was used as the dependent variable. This variable consisted of four categories: <48 hours, 2–7 days, 8–13 days or 14+ days.

In the case of the independent variables, interview variables were developed from the dental literature to reflect potential predictors of 'urgency of care'. Subjective indicators were taken from Locker's battery of eight Subjective Oral Health Status Indicators (SOHSI)

(Locker, 1997). Items within four of the eight SOHSI, namely 'Oral and facial pain symptoms' (10 items), 'Other oral symptoms' (10 items), 'Activities of daily living impact scale' (6 items) and 'Worry/Concern impact scale' (2 items) were used, and an additional block of other symptoms generated out of discussion with staff at participating clinics were included (13 items). All items were pre-coded as either present or absent, except for the Activities of daily living impact scale and Worry/Concern impact scale which were recorded using a Likert type response of "All the time", "Very often", "Fairly often", "Sometimes" or "Never". A reference period of "within the last week" was used for subjective indicators. Quality of life type measures were used based on the reasoning that people with relatively poor quality of life could be expected to have relatively greater urgency for care (McGrath and Bedi, 2004). Dental anxiety, measured using Corah's Dental Anxiety Scale (DAS) (Corah, 1969), was also included as previous research has shown that dental anxiety often leads to more severe presentation of symptoms because of dental care avoidance (Hägglin *et al.*, 2000). Socio-demographic characteristics of the patient (e.g., patient's age, gender, country of birth, Indigenous status and language mainly spoken at home) and dental visiting behaviour (e.g., usual reason for visiting the dentist, time since last visit, site of last visit, frequency of dental visiting) were also collected.

Descriptive statistics on patients, subjective indicators and clinically related data were produced. Bivariate associations between patient characteristics, patient-reported indicators and clinically related data were also examined. The chi-square test was used to study the significance of associations between the dependent and independent variables. The chi-square test was used to screen, using p-value criteria, among candidate variables prior to multivariate modelling. Thus, in order to determine which variables to include in the multivariate models, a less stringent criterion for statistical significance (i.e.,  $p < 0.25$ ) was adopted so as to avoid rejecting potentially significant variables at this stage. Multivariate analysis was undertaken with backward step binary logistic regression analyses. A stepwise modelling technique was adopted because firstly, there were a large number of hypothesised predictive variables and secondly, a stepwise approach was considered to be more advisable for the sake of parsimony.

Prediction of urgency for emergency dental care was based on the development of two models. For each model participants were grouped into two categories - those who were 'urgent' and those who were 'not urgent'. For model 1, the 'urgent' group corresponded to those classified as requiring care within 48 hours and the 'not urgent' group as those considered able to wait 2+ days for dental care. Similarly for model 2, the 'urgent' group corresponded to those judged as requiring care in 2-7 days and the 'not urgent' group as those considered able to wait 8+ days for treatment. The second model excluded all patients who were given an urgency rating of <48 hours by the assessing dentist.

## Results

Of the 920 participants targeted, a total of 839 patients requesting emergency care were recruited across SA and NSW. Overall, data from 91.2% of the target sample was collected.

Across the total sample there was a greater proportion of females sampled (57%,  $n=839$ ), the mean age of participants was 48.2 years ( $\pm 17.6$  years), 64.7% ( $n=838$ ) of participants in the sample were born in Australia, 89.7% ( $n=838$ ) spoke mainly English at home, the majority of participants were of non-Indigenous background (98.0%,  $n=838$ ) and in terms of the highest level of educational attainment, 62.3% ( $n=835$ ) of participants indicated that they had completed some or all of their secondary school education.

According to the assessing dentist, the treatment urgency of 35.8% of participants was <48 hours, 34.8% between 2 and 7 days and 29.4% in 8 or more days.

### *Oral health indicators*

Among those reporting 'Yes' to various problems experienced in the last week (Table 1), 78.1% had experienced pain, 72.3% experienced a toothache, 62.5% said they had experienced pain in their teeth with cold food or fluids, and just under 50% said they had experienced pain with hot food or fluids. Other problems occurring with high frequency included pain at night (45.3%), pain in the jaw while chewing (38.4%), dryness of mouth (35.8%), and pain in teeth with sweet food (34.2%). Almost 56% of the patients reported difficulty sleeping, almost 31% stayed home more than usual because of problems with their teeth, mouth or dentures and just over 26% of the patients reported avoiding their usual leisure activities because of pain or discomfort associated with a dental problem. A high percentage of patients also reported being concerned or worried about their dental health and appearance of their teeth and/or mouth.

A number of variables (28 out of 41) had a significant association ( $\chi^2$ -test;  $p < 0.05$ ) with 'urgency of care' and are marked by a single asterisk (see Table 1). The 13 symptoms that were not significantly associated with urgency of care were shooting pain in face or cheeks, discomfort from a denture, experience of mouth ulcers or cold sores, dryness of mouth, clicking/grating noise in jaw joint, needing to take time off work, swelling of face or neck, a lost or broken filling, broken crown and cracked tooth.

### *Socio-demographic and dental visiting characteristics*

Age of patient was significantly associated ( $\chi^2$ -test;  $p < 0.05$ ) with urgency of care required (see Table 2). Dental visiting patterns of patients are shown in Table 3. Some 47.7% of patients had visited a dentist in the last 12 months and just over 85% of all patients reported that a dental problem or pain was their usual reason for a dental visit. The majority of patients (73.1%) had received their last course of care at a public hospital or clinic and almost 30% indicated that they would usually go to the dentist once every two years. The majority of patients (78.5%) had DAS scores of less than 13 indicating they were not anxious about visiting the dentist or receiving dental treatment. Usual reason for visiting the dentist

**Table 1.** Bivariate associations between oral health indicators and urgency of care

Symptom <sup>a</sup>	n	Urgency of Care (col%)				Total
		<48 hrs	2–7 days	8–13 days	14+ days	
<i>Oral &amp; facial pain symptoms</i>						
- toothache*	786	79.9	82.1	61.5	45.7	72.3
- pain in teeth with hot food or fluids*	782	51.2	58.3	47.4	30.0	49.2
- pain in teeth with cold food or fluids*	781	61.9	70.2	62.8	49.3	62.5
- pain in teeth with sweet foods*	778	38.6	38.5	29.5	20.7	34.2
- pain in jaw while chewing*	781	49.5	41.1	16.9	23.8	38.4
- pain in jaw when open mouth wide*	783	32.5	17.0	10.3	10.6	20.7
- pain in front of ear*	780	37.2	26.7	23.4	15.2	27.9
- burning sensation in tongue/mouth*	780	10.2	8.9	5.2	6.7	8.6
- shooting pain in face or cheeks	780	35.1	26.7	18.2	9.3	25.5
- pain or discomfort from denture	790	6.0	6.9	7.5	6.6	6.6
<i>Other oral symptoms</i>						
- mouth ulcers	785	9.9	10.6	11.4	7.3	9.8
- cold sores	785	7.8	4.8	7.6	5.3	6.2
- sore gums*	786	37.9	32.6	19.0	31.6	33.0
- bleeding gums*	788	27.3	34.5	18.8	24.5	28.4
- bad breath*	787	34.4	37.1	23.8	21.3	31.8
- dryness of mouth	788	37.2	37.8	31.3	31.8	35.8
- unpleasant taste*	788	41.5	38.5	22.5	23.8	35.2
- changes in ability to taste*	786	18.9	15.3	8.8	7.9	14.5
- difficulty opening mouth wide*	783	32.5	17.0	10.3	10.6	20.7
- clicking/grating noise in jaw joint	788	17.7	14.5	10.0	14.6	15.2
<i>Activities of daily living impact scale<sup>‡</sup></i>						
- have difficulty sleeping*	790	70.0	59.3	45.0	28.1	55.6
- stay home more than usual*	790	41.0	33.1	22.5	13.1	31.0
- stay in bed more than usual*	790	25.8	18.2	16.2	4.6	18.1
- take time off work <sup>†**</sup>	782	3.6	3.7	3.8	0.0	2.9
- be unable to do household chores*	791	26.1	20.0	11.2	6.5	18.7
- avoid usual leisure activities*	791	34.6	29.5	25.0	6.5	26.4
<i>Worry/concern impact scale<sup>‡</sup></i>						
- worry about appearance of teeth/mouth*	790	72.8	69.3	78.7	60.8	69.9
- worry about health of teeth/mouth*	785	87.8	89.4	86.2	79.1	86.5
<i>Other symptoms</i>						
- pain worse in the middle of the day*	782	19.4	16.6	9.1	4.6	14.6
- pain at night*	782	57.6	49.1	35.1	20.5	45.3
- swelling on gums*	788	32.6	23.3	7.5	16.6	23.7
- swelling of face or neck	787	24.5	12.8	6.3	5.3	14.9
- a lost filling <sup>†**</sup>	790	26.6	32.7	38.8	28.1	30.3
- a lost crown*	788	3.2	0.7	1.3	4.0	2.3
- a broken filling <sup>†**</sup>	790	25.5	24.7	18.8	15.7	22.7
- a broken crown	798	6.0	4.4	1.3	3.9	4.6
- a loose tooth*	788	19.9	12.4	11.3	5.3	13.6
- a cracked tooth <sup>†**</sup>	788	30.5	28.1	22.5	19.7	26.8
- high temperature*	786	14.9	11.7	7.5	3.3	10.8
<i>Other questions</i>						
- experienced pain*	791	85.5	84.0	78.8	53.6	78.1
- takes any regular medication <sup>†**</sup>	789	47.0	48.5	57.5	55.9	50.3

\* ( $\chi^2$ ;  $p < 0.05$ )

a Response="Yes"

‡ Yes = all the time, very often, fairly often, sometimes

† In the initial selection of significant bivariate associations, a critical  $p = 0.25$  was used to avoid rejecting potentially significant variables at this stage, \*\* ( $\chi^2$ ;  $0.05 < p < 0.25$ )

**Table 2.** Bivariate associations between socio-demographic characteristics and urgency of care

Demographic characteristic	Response	Urgency of Care (col%)				Total
		<48 hrs	2–7 days	8–13 days	14+ days	
Age group* (n=787)	18–24 yrs	10.0	7.7	7.5	9.2	8.8
	25–44 yrs	45.2	43.8	32.5	25.7	39.6
	45–64 yrs	26.7	25.5	40.0	33.6	29.0
	65+ yrs	18.1	23.0	20.0	31.6	22.6
Gender of patient †** (n=791)	Female	53.0	56.7	66.3	60.1	57.0
	Male	47.0	43.3	33.8	39.9	43.0
Australian born (n=790)	Yes	38.9	31.6	36.7	34.0	35.2
	No	61.1	68.4	63.3	66.0	64.8
Language mainly spoken at home (n=790)	English	89.7	91.3	86.3	90.2	90.0
	Other	10.3	8.7	13.8	9.8	10.0

\* ( $\chi^2$ ;  $p < 0.05$ )† In the initial selection of significant bivariate associations, a critical  $p = 0.25$  was used to avoid rejecting potentially significant variables at this stage, \*\* ( $\chi^2$ ;  $0.05 < p < 0.25$ )**Table 3.** Bivariate associations between dental visiting characteristics and urgency of care

Dental visiting behaviour	Response	Urgency of Care (col%)				Total
		<48 hrs	2–7 days	8–13 days	14+ days	
Usual reason for dental visit* (n=786)	Check-up	8.2	13.5	17.7	21.2	13.5
	Problem/pain	90.4	85.4	82.3	76.2	85.1
	Check-up/Problem/Pain	1.4	1.1	0.0	2.6	1.4
Time since last dental visit (n=791)	<12 months	43.8	50.5	43.8	51.6	47.7
	1–<2 years	20.8	18.5	18.8	19.0	19.5
	2–<3 years	11.3	12.7	12.5	10.5	11.8
	3–<5 years	8.8	8.0	8.8	9.8	8.7
	5+ years	14.5	9.8	16.3	9.2	12.0
Place of last dental visit (n=788)	Never	0.7	0.4	0.0	0.0	0.4
	Private practice	22.4	22.9	22.8	21.7	22.5
	Public hospital/clinic	71.9	73.1	74.7	74.3	73.1
Frequency of dental visits (n=784)	School dental clinic/other	5.7	4.0	2.5	3.9	4.4
	>2 times a year	7.6	6.2	12.5	9.2	7.9
	2 times a year	7.6	8.4	7.5	7.2	7.8
	Once a year	21.2	25.3	22.5	26.8	23.9
	Once every 2 years	27.3	28.6	25.0	28.8	27.8
	Once every 5 years	14.7	11.7	11.3	11.8	12.8
DAS score ††* (n=791)	<Once every 5 years	21.6	19.8	21.3	16.3	19.9
	DAS score < 13	73.5	80.0	73.8	87.6	78.5
	DAS score $\geq$ 13	26.5	20.0	26.3	12.4	21.5

\* ( $\chi^2$ ;  $p < 0.05$ )

†† The Dental Anxiety Scale (DAS) consists of four items. The respondent was asked to indicate on a five-point scale how the statement made them feel. The scale was scored by summing the responses to obtain a score between 4 and 20. A minimum score of 4 indicated no dental anxiety and a maximum score of 20 indicated that the patient was dentally phobic. A cut-off score of 13 was used to distinguish between those who were dentally anxious and those who were not.

and DAS score was significantly associated ( $\chi^2$ -test;  $p < 0.05$ ) with urgency of care required.

### Multivariate predictors of urgency of care

#### Model 1: Urgency of care = <48 hours versus 2+ days

A set of seven subjective oral health indicators were identified as being statistically significant in the logistic regression model and thus important in terms of predicting those requiring care in <48 hours. The odds ratios (OR) and their respective 95% confidence intervals (CI) for urgency of care are presented in Table 4. Persons who experienced pain in their jaw when opening their mouth wide had 2.4 times the odds of requiring treatment within 48 hours compared to those who did not report this symptom. Persons who reported bleeding gums had 0.7 times the odds of requiring emergency care within 48 hours compared to those who did not report having bleeding gums. Patients reporting a broken filling had 1.7 times the odds of requiring dental care within 48 hours compared to persons who did not report a broken filling. Patients reporting a loose tooth had 2.4 times the odds of requiring dental care within 48 hours compared

to persons who did not report a loose tooth. The largest statistically significant effect was observed for persons who reported difficulty sleeping all the time because of pain, discomfort or other problems with their teeth mouth or dentures. These people had 4.8 times the odds of requiring emergency care within 48 hours compared to those who reported no difficulty sleeping. Those with a DAS score of 13 or more had 1.5 times the odds of needing treatment within 48 hours compared to those with a lower score. Being worried about the health of one's teeth or mouth also emerged as a significant predictor of needing care within 48 hours.

#### Model 2: Urgency of care = 2-7 days versus 8+ days

Six subjective oral health indicators were identified as being significant in the logistic regression model predicting those requiring care in 2-7 days. The ORs and their respective 95% CIs for urgency of care are presented in Table 4. Those reporting to have had a toothache in the last week had 2.6 times the odds of requiring emergency treatment within 2-7 days compared to those who did not have a toothache. Those persons reporting pain in their teeth with hot food or fluids, bleeding gums and/

**Table 4.** Binary logistic regression analysis to predict urgency of dental care: odds ratios and 95% confidence intervals

Independent variable	<i>p</i> (urgent) = <48 hours <sup>†</sup>		<i>p</i> (urgent) = 2-7 days <sup>‡</sup>	
	OR	95% CI for OR	OR	95% CI for OR
- toothache <sup>a</sup>			2.629	(1.600, 4.319)
- pain in teeth with hot food or fluids <sup>a</sup>		NA	1.917	(1.248, 2.945)
- pain worse in the middle of the day <sup>a</sup>			1.883	(0.945, 3.752)
- pain in teeth with cold food/fluids <sup>a</sup>	0.704	(0.488, 1.015)		
- pain in jaw when opening mouth wide <sup>a</sup>	2.415	(1.572, 3.712)		NA
- shooting pain in face or cheeks <sup>a</sup>	1.490	(0.987, 2.249)		
- bleeding gums <sup>a</sup>	0.663	(0.451, 0.975)	2.009	(1.268, 3.184)
- a broken filling <sup>a</sup>	1.650	(1.115, 2.441)	2.080	(1.238, 3.495)
- a loose tooth <sup>a</sup>	2.352	(1.470, 3.763)		
- difficulty sleeping <sup>b</sup>				
All the time	4.829	(2.960, 8.024)	2.941	(1.361, 6.355)
Very often	2.877	(1.528-5.417)	2.920	(1.098, 7.761)
Often	1.153	(0.599, 2.220)	2.668	(1.224, 5.817))
Sometimes	1.933	(1.242, 3.007)	1.169	(0.686, 1.992)
- worried about health of teeth or mouth <sup>b</sup>				
All the time	0.635	(0.357, 1.131)		
Very often	1.661	(0.897, 3.076)		NA
Often	1.147	(0.599, 2.193)		
Sometimes	1.204	(0.662, 2.191)		
- worried about appearance of teeth or mouth <sup>b</sup>				
All the time			0.665	(0.387, 1.144)
Very often		NA	0.305	(0.141, 0.659)
Often			1.309	(0.598, 2.866)
Sometimes			0.556	(0.305, 1.014)
- DAS score $\geq$ 13	1.518	(1.018, 2.264)		NA

<sup>†</sup> Analysis used n=750 patients with complete data on all variables

<sup>‡</sup> Analysis used n=476 patients with complete data on all variables

<sup>a</sup> Reference category for odds ratio is "No"

<sup>b</sup> Reference category for odds ratio is "Never"

NA Not applicable

or a broken filling had two times the odds of needing emergency treatment within 2–7 days compared to those not reporting such symptoms. Those who experienced difficulty sleeping all the time because of pain, discomfort or other problems with their teeth mouth or dentures had 2.9 times the odds of requiring emergency dental treatment within 2–7 days compared to those who had no difficulty sleeping. Persons who reported being worried about the appearance of their teeth or mouth very often had 0.3 times the odds of requiring emergency care within 2–7 days compared to those who did not report the same concern.

## Discussion

The data reported in this paper were derived from individual patient experience of the problems with which they presented to public dental clinics and were cross-matched with a clinical judgement of urgency provided by the assessing dentist. Subjective oral health indicators (i.e., experience of pain or other oral symptoms), and psychosocial impact of oral disorders (i.e., difficulty sleeping and being worried about the appearance/health of one's teeth or mouth) proved to be the best predictors of urgency of care.

The central difficulty of triaging emergency patients is identifying, in the absence of a clinical assessment, the oral symptoms that in combination contribute the most to the level of urgency of treatment for the patient. However, this study has identified a pertinent set of subjective indicators that could assist non-dental staff with assessing patient priority prior to seeing the dentist. Hence, if patient perception and dentist perception are assumed to express the pragmatic experience of access to care then the results suggest that some triaging of emergency dental care patients using questions similar to the ones asked in the questionnaire may not be seen as unreasonable by both patients and service providers.

Systems with such explicitly defined outcomes when used in a systematic manner can contribute to equity by ensuring that reception staff, who are the 'gatekeepers' to access to oral health services in public dental services, assess need in a transparent and consistent manner. Such an approach facilitates equity between patients seeking care.

Such a system, which has the ability to schedule care of patients ahead of time, can be easily integrated into management systems replacing current systems which operate on a "first come first seen" basis leading potentially to greater system efficiency and options for patients to make appointments which suit them, possibly reducing failure to attend.

By managing 'emergency' patients in a more systematic way, there may also be an opportunity to gradually reorient public dental services toward providing more preventive services by removing the bottleneck of emergency patients. Such an approach may also enhance staff satisfaction and retention rates of dentists.

Before these models are introduced into public dental services across Australia, the models must be tested further to establish whether the predictions are valid in other settings. Predictive power is maximised when using similar groups of patients and when the models

are applied in the context of public dental services in Australia – applying the models outside of the population from which they were developed should be done with caution. Changing disease patterns of a population will also influence the applicability of the models, even within the public dental care setting. Nevertheless, the underlying explicit rationing of emergency dental care based on predictive models built upon subjective oral health indicators and psychosocial impacts of oral conditions offers promise in the delivery of appropriate and timely access to dental care services to those with an urgent dental need. These models also have the potential to reform seeking of emergency dental care by reducing the number of emergencies seen which would allow the reallocation of funding from emergency dental care to general dental care, thus improving access to general dental care and longer-term oral health outcomes.

## Acknowledgements

This study was supported by contracts from the SA Dental Service and NSW Oral Health Branch. The extensive time and effort contributed by the staff of these organisations in the collection and provision of the data is gratefully acknowledged.

## References

- Bader, J.D. and Shugars, D.A. (1995): Variation in dentists' clinical decisions. *Journal of Public Health Dentistry* **55**, 181–188. Review.
- Bader, J.D. and Shugars, D.A. (1997): What do we know about how dentists make caries-related treatment decisions? *Community Dentistry and Oral Epidemiology* **25**, 97–103. Review.
- Corah, N.L. (1969): Development of a dental anxiety scale. *Journal of Dental Research* **48**, 596.
- Hägglin, C., Hakeberg, M., Ahlqwist, M., Sullivan, M. and Berggren, U. (2000): Factors associated with dental anxiety and attendance in middle-aged and elderly women. *Community Dentistry and Oral Epidemiology* **28**, 451–460.
- Locker, D. (1988): Measuring oral health: a conceptual framework. *Community Dental Health* **5**, 3–18.
- Locker, D. and Jokovic, A. (1996): Using subjective oral health status indicators to screen for dental care needs in older adults. *Community Dentistry and Oral Epidemiology* **24**, 398–402.
- Locker, D. (1997): Subjective oral health status indicators. In: *Measuring oral health and quality of life*; ed. Slade, G.D. pp105–112. Chapel Hill: University of North Carolina, Dental Ecology.
- McGrath, C. and Bedi, R. (2004): The association between dental anxiety and oral health-related quality of life in Britain. *Community Dentistry and Oral Epidemiology* **32**, 67–72.
- Robinson, P.G., Nadanovsky, P. and Sheiham, A. (1998): Can questionnaires replace clinical surveys to assess dental treatment needs of adults? *Journal of Public Health Dentistry* **58**, 250–253.
- Sheiham, A. and Croog, S.H. (1981): The psychosocial impact of dental diseases on individuals and communities. *Journal of Behavioral Medicine* **4**, 257–272.
- Spencer, A.J. (2001): What options do we have for organizing, providing and funding better public dental care? Australian Health Policy Institute, University of Sydney.
- Tickle, M., Craven, R., and Blinkhorn, A.S. (1997): An evaluation of a measure of subjective oral health status in the U.K. *Community Dental Health* **14**, 175–180.