Practice belief scales among private general dental practitioners

DS Brennan,* AJ Spencer*

Abstract

Background: Practice beliefs have been related to service rate variation. The aims of this study were to replicate practice belief scales in Australia and investigate associations with dentist and practice characteristics and services.

Method: A random sample of Australian dentists completed mailed questionnaires (response rate 60.3 per cent).

Results: Private general practitioners (n=345) provided service data from a typical day. Eight practice belief items were recorded on a five-point Likert scale, yielding four factor-based scales. Approximately 85 per cent of responses were on the agreement side of the midpoint for the scales of Information giving and Patient influence, 45 per cent for Preventive orientation and approximately 10 per cent for Controlling active disease rather than developing better preventive advice.

Capital city dentists had higher agreement with the Preventive orientation scale, while males and older dentists showed less disagreement with the Controlling active disease item (Mann-Whitney, Kruskal-Wallis P<0.05).

Those agreeing with the scales (that is scores ≤ the median) showed (Poisson regression P<0.05): a higher rate of crown and bridge, a rate ratio (RR) of 1.31, but lower rates of extraction (RR=0.76) and prosthodontic services (RR=0.64) for the Information giving scale; a higher rate of restorative (RR=1.22) and total services per visit (RR=1.06) for the Preventive orientation scale; a higher rate of preventive services (RR=1.14), but a lower rate of crown and bridge services (0.78) for the Patient influence scale; and higher rates of crown and bridge (RR=1.40) and prosthodontic (RR=1.59) but lower rates of periodontic (RR=0.60) and extraction services (RR=0.62) for the Controlling active disease item.

Conclusions: These findings confirm the factor structure of practice beliefs and demonstrate small to moderate associations with variation in service rates.

Key words: Practice beliefs, general dental practice, service rates.

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INTRODUCTION

Service rates have been shown to vary between practices,[1] raising concerns regarding aspects of appropriateness of care.[2-3] A range of factors may have an influence on the observed variation in service rates. Practitioners provide one source of potential variation, where their attitudes, values or habits can lead to the development of preferences for particular treatments or services.[4] Clusters of dentists have been identified with particular practice styles in both the US[5] and Australia.[6]

In the US, practice beliefs of dentists have been related to variation in service rates.[7-8] These studies of the practice beliefs of dentists used factor analysis to derive three factors based on the level of agreement with items relating to preventive dentistry, patient influence in clinical decision making and the role of information giving in the dentist-patient relationship. The factor preventive orientation (PO) was expected to have a negative effect on restorative and related service rates, while the factors patient influence (PI) and information giving (IG) were expected to have an inverse relationship to the total service rate as these beliefs would allow a greater role for patients in decision making which may constrain provision of services by dentists.[8]

These studies of practice beliefs were performed in the US and were confined to a homogeneous patient population. While there is a general need to replicate research findings, this may be particularly important in studies using factor analysis, where the evidence for factors is more compelling when they are observed in a range of samples.[9] Replication need not be literal duplication but involve constructive replication based on the same problems and variables.[10] The aims of this study were to replicate practice belief scales in the Australian context and investigate associations with dentist and practice characteristics and service rates.

MATERIALS AND METHODS

Sampling

Dentists were sampled at random from the dental registers of each Australian state and territory based on a sampling rate of 13.5 per cent, resulting in a total

*Department of Dentistry, Adelaide University, Australia.

Table 1. Gender, age, practice type and location by service log status.

| | Service log status | | |
	Service data	No service data	P (chi-square)
	%	%	
Gender of dentist			
Male	80.0	83.9	0.48
Female	20.0	16.1	
Age of dentist			
20-29	13.9	8.3	0.50
30-39	27.8	26.7	
40-49	29.3	33.3	
50-59	18.3	15.0	
60+	10.7	16.7	
Practice type			
Solo	51.3	48.3	0.19
Partnership	10.4	18.3	
Associateship	17.7	11.7	
Assistant	17.7	21.7	
Other	2.9	0.0	
Geographic location			
Capital city	84.1	91.5	0.14
Non-capital	15.9	8.5	

sample of 1,202 dentists. Data were collected by mailed self-completed questionnaires.[11-12] Data items collected included practice beliefs, dentist characteristics, practice variables and services provided during a typical day.

Data items

Eight practice belief items were collected, based on previous reports on service rate variation.[8,13] Services provided during a typical day were collected from a one-day log of services. The number of patients sampled in the log varied according to the typical level of activity of each dentist. Only sampled dentists in a group practice provided data. Dentists were instructed to record the services provided to each patient treated on their selected typical day regardless of whether or how these services were charged to the patient. Service items were recorded using the Australian Dental Association's Schedule of Dental Services.[14] Service rates were calculated by dividing the number of services in each main area of service by the number of patients seen to provide a rate of service provision per patient visit for each dentist. Reliability analyses have indicated no significant difference in service rates between data collected over a 10-day sampling period compared to estimates based on one typical day nominated from the 10-day period by the responding dentists.[6]

Data analysis

Factor analysis was used to examine the battery of practice belief items for underlying component factors. Scales derived from factor analysis were examined for reliability and the final factor-based scales were constructed giving consideration to the reasonableness of the factors (for example, interpretation, conceptual coherence) and reliability of the scales. For ease of

interpretation, the scales were calculated by adding the responses to the individual items and dividing by the number of items in a scale to achieve a score ranging from 1 to 5. This results in a scale which conforms to the original range and where all items contribute equally.[15] For example, a scale comprising three items which had been answered by the responses 4, 3 and 1 would add up to 8 and when divided by the number of items (that is, 3) yield a per item response of 2.7 for the scale. Scales were then examined by dentist and practice characteristics using Mann-Whitney and Kruskal-Wallis tests. Provision of services in the 10 main areas of service were used as the dependent variables in a series of Poisson regressions with scales as the independent variables, dichotomised into groups using the median as the cutoff and coded as indicator variables with values less than or equal to the median coded as 1 and values greater than the median coded as 0. Rate ratios (RR) for services were derived by exponentiating the parameter estimates of the dichotomised scales from the Poisson regression models to obtain a measure of the magnitude of the difference in service rates between dentists who had higher agreement with a scale (that is, less than or equal to the median) compared to dentists who had scale scores greater than the median. The data reported here are restricted to private general practice dentists. General practice comprised the highest main area of dental practice in Australia (84.6 per cent) and the majority of dentists were from the private sector (81.4 per cent).[16]

RESULTS
Response

A total of 676 dentists responded to the survey, resulting in a response rate of 60.3 per cent after removing 81 dentists from the sample who were excluded for reasons such as they were working abroad or could not be contacted at their registered addresses. Excluding 124 responses for reasons such as ill-health and retirement, a total of 552 responses was available for analysis, of which 451 were in general practice. Of the 451 general practitioners, 418 were in the private sector and 407 of these private general practitioners were currently treating patients. A total of 345 private general practitioners provided service provision data in a log of a typical clinical day, while 62 did not provide service data (for example, for reasons such as not having enough time to complete the log). Characteristics of private general practitioners who supplied data were compared to those who did not, to assess potential bias arising from failure to provide service provision information. Table 1 shows there were no significant differences by service log status for dentist age, dentist gender, practice type or geographic location.

Dentist age and gender distribution

Table 2 shows the 345 responding private general practitioners consisted of 276 males (80 per cent) and 69 females (20 per cent). The majority of respondents

Table 2. Age and gender distribution of responding private general practitioners who provided service provision data and comparative population data on private practitioners.

Dentist age	Responding practitioners						Dentist population data*		
	Gender of dentist						Gender of dentist		
	Male		Female		All		Male	Female	All
	n	%	n	%	n	%	%	%	%
20-29	29	10.5	19	27.5	48	13.9	9.4	25.1	12.3
30-39	69	25.0	27	39.1	96	27.8	28.0	42.6	30.7
40-49	85	30.8	16	23.2	101	29.3	29.8	22.0	28.4
50-59	56	20.3	7	10.1	63	18.3	17.6	7.1	15.7
60+	37	13.4	0	0.0	37	10.7	15.1	3.2	12.9
Total	276		69		345				

*Dental practitioner statistics, Australia, 1994. Szuster and Spencer, 1997

were in the age groups 30-39 (27.8 per cent) and 40-49 (29.3 per cent). Male dentists had an older age distribution than females, with higher percentages in the age groups 40-49 (30.8 per cent vs 23.2 per cent), 50-59 (20.3 per cent vs 10.1 per cent) and 60+ (13.4 per cent vs 0 per cent). Compared to the age distribution of the dentist population, the responding practitioners had a similar pattern by age.[16] Both distributions were dominated by the 30-39 and 40-49 age groups, with male dentists having an older distribution compared to female dentists.

Patient age and gender distribution

Table 3 shows the age and gender distribution of patients treated by the responding private general practitioners during their log of a typical clinical day. Data were collected from a total of 4,115 patients. Of these, 4,046 patients' forms had complete data for age and gender, giving a sample of 1,832 males and 2,214 females. Overall, there were small percentages of younger patients (under 5 per cent). The highest percentages of patients were aged 25-44 (34.5 per cent) and 45-64 (30.6 per cent). The age distributions were similar for male and female patients.

Distribution of practice belief items

The distribution of the practice belief items is presented in Table 4. Responses were scored on a five-point Likert scale ranging from 1 (strongly agree) to 5

Table 3. Age and gender distribution of patients treated by responding private general practitioners.

Patient age	Gender of patient					
	Male		Female		All	
	n	%	n	%	n	%
<5	24	1.3	13	0.6	37	0.9
5-11	151	8.2	142	6.4	293	7.2
12-17	131	7.2	171	7.7	302	7.5
18-24	122	6.7	178	8.0	300	7.4
25-44	606	33.1	788	35.6	1394	34.5
45-64	566	30.9	671	30.3	1237	30.6
65+	232	12.7	251	11.3	483	11.9
Known	1832		2214		4046	
Unknown	–		–		69	
Total	–		–		4115	

(strongly disagree) for each particular item. The direction of responses was reversed for item 6 during subsequent scale development. Most items were skewed to one end of the distribution, with items 1, 4, 5, 7 and 8 skewed toward 1 (strongly agree) while items 2 and 6 were skewed toward 5 (strongly disagree). Item 3 was not skewed. Only two items, 2 and 3, had a percentage greater than 20 per cent for the midpoint response (that is, 3).

Scale development

Factor analyses were performed using principal components with varimax rotation.[17] Reliability of the factor-based scales was assessed by Cronbach's alpha.[18] Retaining factors with eigenvalues greater than 1 are commonly used, based on heuristic and practical grounds.[19] If the number of variables is less than 20, there is a tendency to extract a conservative number of factors, while there is a tendency to extract too many factors with eigenvalues greater than 1 when there are 50 or more variables.[20] While scree plots can also be used to determine the number of factors, this is often very subjective.[19] Similarly, the substantive importance attached to the proportion of variance explained by each factor also involves judgement and may be set at whatever the researcher considers to be important. Hence, there is no unambiguous rule to use when selecting the number of factors, with final judgement involving the reasonableness of the solution and knowledge of the subject matter.[19,21]

Table 5 presents the results of a factor analysis of the practice belief items. There were three factors with eigenvalues greater than 1, with a fourth factor just below 1. As the fourth factor accounted for a substantial percentage of variance (11.9 per cent), a four-factor solution was preferred. Sampling adequacy, which relates to the degree that the subset of variables used in the analysis represents a potentially larger domain, was acceptable, being above 0.50.[19] The communality values were all above 0.30, indicating the factors accounted for a large percentage of the sample variance of each variable.[20-21] Items which loaded on a factor are indicated in the table by a box around the factor loading. Of the four factors obtained, all except the first were under-identified, having less than the preferred three to four items per factor.[22] This under-

Table 4. Distribution of responses (1=strongly agree to, 5=strongly disagree) to the practice belief items.

Item	Description of item	Distribution of responses %					Skew	Mean	SE
		1	2	3	4	5			
1	Plaque control programs are a prerequisite for dental treatment	52.5	26.4	13.8	6.2	1.2	1.16	1.77	(0.05)
2	The primary focus of dentistry should be directed at controlling active disease rather than developing better preventive advice	4.1	5.6	31.1	36.4	22.9	-0.60	3.68	(0.06)
3	If a patient disagrees with the dentist's recommended treatment, the dentist should try to convince the patient to accept it	6.7	23.4	33.0	25.4	11.4	-0.01	3.11	(0.06)
4	Dentists should usually inform patients about the cost of their treatment before the treatment begins	65.6	27.4	5.0	0.6	1.5	2.23	1.45	(0.04)
5	With the dentist's advice, the patient should choose the service	47.1	31.2	17.9	2.1	1.8	1.10	1.80	(0.05)
6*	If a patient does not accept the dentist's recommended treatment, the patient is dismissed from the practice	2.1	1.5	11.5	31.3	53.7	-1.54	4.33	(0.05)
7	Dentists should present all treatment options to patients	69.7	23.3	4.1	1.5	1.5	2.41	1.42	(0.04)
8	Excluding diagnostic and preventive services, all patients should usually know how much their dental treatment will cost them before treatment begins	49.6	34.3	11.7	2.1	2.3	1.46	1.73	(0.05)

*Direction reversed in subsequent scale development.

identification may contribute to the low values of Cronbach's alpha obtained for the items loading most strongly on each factor. Only the first factor, with α=0.65, approached the minimum recommended level of 0.70.[16] While the reliability of the scales based on the factors was low, the factor structure which was obtained corresponded well with the previous findings.[8] The first factor (PB 1) includes items in the IG factor,[8] with the addition of item 4. The second factor (PB 2) consists of the PO factor, while the third factor (PB 3) consists of the PI factor.[8] The remaining factor (PB 4) consists of the single item relating to controlling active disease versus developing better preventive advice (CA). These factors are treated as separate scales which cover different practice beliefs and have not been combined into a single scale.

Table 6 presents the distribution of the factor-based practice belief scales. These scales are treated as continuous variables, ranging from 1 (strongly agree) to 5 (strongly disagree). Scores less than or equal to 2 represent agreement with the practice belief measured by a particular scale. Approximately 85 per cent of responses were in agreement with the practice beliefs of IG and PI. However, only 45 per cent of practitioners indicated agreement with the PO scale and approximately 10 per cent agreed with the item relating to CA.

Practice belief scales by dentist and practice characteristics

Table 7 presents the mean practice belief scales by dentist and practice characteristics. These scales are measured from 1 (strongly agree) to 5 (strongly disagree), with lower mean scores indicating higher agreement. Overall, there were few significant differences in practice belief scales. Dentists practising

Table 5. Factor analysis of practice beliefs.

	Initial statistics[a]					Final statistics[b]				
		Variance				Factor loadings				
Factor	Eigenvalue	%	Cum %	Item	Item label	PB 1	PB 2	PB 3	PB 4	h²
1	1.96	24.5	24.5	1	Plaque control	.07	.76	.01	-.25	.64
2	1.20	15.0	39.5	2	Disease vs prevent	.02	-.00	.02	.93	.86
3	1.05	13.1	52.6	3	Convince to accept	-.03	.74	-.02	.23	.61
4	0.96	11.9	64.5	4	Inform about cost	.80	-.03	.14	.14	.68
5	0.89	11.1	75.6	5	Dentist advice	.15	.17	.70	.05	.54
6	0.80	10.0	85.6	6	*Dismiss from practice	.05	-.17	.75	-.03	.60
7	0.72	9.0	94.6	7	Treatment options	.58	.01	.30	-.20	.46
8	0.43	5.4	100.0	8	Know cost	.87	.06	-.05	.02	.77
					Variance %	22.1	14.9	14.5	13.0	
					Cronbach alpha	0.65	0.29	0.21	–	

(a) Method=principal components. (b) Rotation=varimax. h2=Communality.
*Direction reversed in scale development. Kaiser's measure of sampling adequacy=0.62.

Table 6. Distribution of practice belief scales.

	Description of scale	Distribution of responses %					Skew	Mean	SE
		1	≤2	≤3	≤4	≤5			
PB1	Information giving scale	37.5	86.2	98.2	99.4	100.0	1.78	1.53	(0.03)
PB2	Preventive orientation scale	5.6	45.0	83.8	97.9	100.0	0.41	2.44	(0.04)
PB3	Patient influence scale	27.7	84.2	97.9	99.1	100.0	1.41	1.73	(0.04)
PB4	Controlling active disease item	4.1	9.7	40.8	77.2	100.0	-0.60	3.68	(0.06)

in a capital city had a higher level of agreement with the PO scale, while males and older dentists showed less disagreement with the CA item, although they were still above 3 (the midpoint).

Dentists' age and gender were not statistically associated with geographic location. However, both age and gender of dentist were associated with practice type (chi-square P<0.05) with a lower percentage of female dentists for solo (11.9 per cent) compared to non-solo (28.6 per cent) practice types and lower percentages of younger dentists for solo compared to non-solo practice types (for example, 4.5 per cent of solo practitioners were aged 20-29 compared to 23.8 per cent of non-solo practitioners). These associations by age and gender of dentists did not lead to confounding as there were no statistically significant associations of practice type with the practice belief scales.

Service rates by practice belief scales

Table 8 presents mean rates of services per patient visit by the practice belief scales which have been dichotomised into less than or equal to the median (strongly agree or agree) and greater than the median (toward the disagree to strongly disagree end of the scale). Those agreeing with the IG scale (scores ≤ the median of 1.33) had a higher rate of crown and bridge services, a RR of 1.31, but lower rates of extraction (RR=0.76) and prosthodontic services (RR=0.64). Those agreeing with the PO scale (scores ≤ the median of 2.5) had a higher rate of restorative services (RR=1.22) and also total services per visit (RR=1.06).

Those agreeing with the PI scale (scores ≤ the median of 1.5) had a higher rate of preventive services (RR=1.14) but a lower rate of crown and bridge services (RR=0.78). Those with scores for the CA item ≤ the median of 4 had higher rates of crown and bridge (RR=1.40) and prosthodontic services (RR=1.59) but lower rates of periodontic (RR=0.60) and extraction services (RR=0.62).

DISCUSSION

Practice beliefs of dentists appeared to be stable as the factor structure of Grembowski was replicated,[8] but the scales had low reliability. This may be because the factors were under-identified and require more items to measure them with greater reliability.[22] The single item CA was associated with more crown and bridge and prosthodontic services, but less periodontic and extraction services, and may warrant further development to better identify the construct which this item represents. While the measure of sampling adequacy was acceptable, the low reliability measures considered along with the similarity of some items (for example, items 4 and 8) in the scales and the need to better identify some of the constructs indicates scope for further development to improve the scales. There is often some question as to correct naming of factors (for example, does PA really represent what it purports to?). Rectification of factors may occur and researchers are cautioned against attributing reality and uniqueness to factors (giving a factor a name does not give it reality). However, factors that recur from different samples and conditions point to an underlying variable.[9]

Table 7. Practice belief scales by dentist and practice characteristics.

	Information giving		Preventive orientation		Patient influence		Controlling active disease	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Gender of dentist							**	
Male	1.53	(0.04)	2.44	(0.05)	1.73	(0.04)	3.60	(0.06)
Female	1.52	(0.09)	2.46	(0.09)	1.72	(0.08)	4.01	(0.12)
Age of dentist							**	
20-29	1.64	(0.12)	2.41	(0.09)	1.81	(0.11)	4.06	(0.12)
30-39	1.48	(0.05)	2.42	(0.08)	1.78	(0.07)	3.74	(0.11)
40-49	1.61	(0.07)	2.50	(0.07)	1.69	(0.07)	3.80	(0.09)
50-59	1.48	(0.07)	2.43	(0.11)	1.69	(0.07)	3.38	(0.13)
60+	1.39	(0.07)	2.44	(0.19)	1.63	(0.01)	3.20	(0.18)
Location			*					
Capital city	1.52	(0.04)	2.41	(0.05)	1.71	(0.04)	3.67	(0.06)
Non-capital	1.59	(0.10)	2.62	(0.10)	1.79	(0.11)	3.80	(0.13)
Practice type								
Solo	1.53	(0.04)	2.39	(0.06)	1.71	(0.05)	3.66	(0.08)
Non-solo	1.53	(0.05)	2.50	(0.06)	1.74	(0.05)	3.71	(0.08)

*(P<0.05), **(P<0.01) Mann-Whitney, Kruskal-Wallis test.

Table 8. Mean services per visit by dichotomised practice belief scales.

	Information giving		Preventive orientation		Patient influence		Controlling active disease	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Diagnostic								
Scale >median	0.67	(0.04)	0.67	(0.04)	0.68	(0.03)	0.68	(0.05)
Scale ≤median	0.69	(0.03)	0.69	(0.03)	0.68	(0.03)	0.68	(0.02)
Preventive					*			
Scale >median	0.36	(0.02)	0.37	(0.03)	0.35	(0.02)	0.38	(0.03)
Scale ≤median	0.37	(0.02)	0.36	(0.02)	0.38	(0.02)	0.36	(0.02)
Periodontic							*	
Scale >median	0.025	(0.006)	0.025	(0.007)	0.026	(0.006)	0.032	(0.011)
Scale ≤median	0.021	(0.005)	0.021	(0.005)	0.021	(0.005)	0.020	(0.004)
Extraction	*						**	
Scale >median	0.09	(0.01)	0.10	(0.02)	0.08	(0.01)	0.12	(0.03)
Scale ≤median	0.08	(0.01)	0.08	(0.01)	0.09	(0.01)	0.08	(0.01)
Endodontic								
Scale >median	0.13	(0.02)	0.12	(0.02)	0.13	(0.02)	0.15	(0.02)
Scale ≤median	0.14	(0.01)	0.14	(0.01)	0.15	(0.02)	0.13	(0.01)
Restorative			**					
Scale >median	0.66	(0.04)	0.56	(0.03)	0.62	(0.03)	0.69	(0.06)
Scale ≤median	0.63	(0.03)	0.69	(0.03)	0.60	(0.04)	0.63	(0.03)
Crown/bridge	*				*		*	
Scale >median	0.08	(0.01)	0.08	(0.02)	0.09	(0.02)	0.07	(0.02)
Scale ≤median	0.10	(0.01)	0.10	(0.01)	0.08	(0.01)	0.10	(0.01)
Prosthodontic	**						**	
Scale >median	0.15	(0.05)	0.09	(0.02)	0.09	(0.02)	0.07	(0.01)
Scale ≤median	0.08	(0.01)	0.12	(0.03)	0.13	(0.04)	0.13	(0.03)
Orthodontic								
Scale >median	0.003	(0.002)	0.002	(0.002)	0.004	(0.002)	0.002	(0.002)
Scale ≤median	0.004	(0.002)	0.004	(0.002)	0.004	(0.002)	0.004	(0.002)
General/misc								
Scale >median	0.05	(0.01)	0.05	(0.01)	0.05	(0.01)	0.04	(0.01)
Scale ≤median	0.04	(0.01)	0.05	(0.01)	0.04	(0.01)	0.05	(0.01)
Total services			*					
Scale >median	2.23	(0.06)	2.07	(0.05)	2.13	(0.05)	2.23	(0.08)
Scale ≤median	2.16	(0.05)	2.25	(0.05)	2.25	(0.06)	2.18	(0.04)

*(P<0.05), **(P<0.01) Poisson regression.

Previous analysis of service rates and practice beliefs found PA associated with more crowns but less crown buildups and root canal therapy, while PI was associated with fewer extractions and IG with less bridge work.[8] In this study, beliefs of PO were associated with higher rates of restorative and total services per visit, PI with higher preventive rates and IG with lower extraction and prosthodontic rates but higher crown and bridge rates. Some differences between the studies may be related to definition and categorisation of services. Despite some lack of overlap between the studies in associations of beliefs with specific services, there was convergence in the pattern of results consistent with an underlying construct (for example, PA was associated with more preventive and less extraction services). However, there may be some discrepancy between the factor names and service patterns and hence the constructs they actually represent. Information giving comprises items mainly related to cost of treatment and may reflect informing patients regarding cost, which is consistent with higher rates of crown and bridge services. Preventive orientation was not associated with higher preventive rates, with the scale comprising one PI item (plaque control) but also one item related to professional authority in treatment planning (convince to accept). This aspect of the scale may be more related to higher provision of restorative, crown and bridge and total services.

A methodological question concerns the degree of sensitivity to cutoff scores used. The median was used as an empirically based choice which was interpretable in terms of the agree/disagree continuum of the scale. This was preferred to any of the compelling conceptually based alternatives. While the midpoint value of a scale may be considered as the middle of the response continuum, an advantage of using the median is that it adjusts for any skew present in the responses on the scale. Where there is a high degree of skew toward one end of a scale, using the median as a cutoff may provide greater statistical power by dividing the respondents into nearly equal sized groups. However, this needs to be considered when interpreting the results, as both groups may have, on average, a high degree of agreement on the dimension being measured. Another methodological aspect concerns the original findings of Grembowski,[7] which showed that little variation in rates was explained by practice beliefs when based on a limited number of broad categories of services (diagnostic, preventive, restorative, periodontic and total service rate). The present analysis of a wider range of broad categories (10 areas plus total services

rather than four areas plus total services) found more associations. While multiple tests were performed, the 11 significant results out of 44 (25 per cent) were above that expected by chance.

The findings demonstrate small to moderate, statistically significant, effects in relation to practice beliefs, with rate ratios ranging from 0.60 to 0.78 below 1, and 1.06 to 1.59 above 1. The generality of these practice belief factors was enhanced due to their replication in the Australian context. However, there is a need to assess their role in models of service provision which account for other variables including dentist, practice and patient factors. For example, patient characteristics (age), visit characteristics (visit type and insurance) and practice location (capital or non-capital city) have been related to service variation in Australia.[23-26] Practice beliefs are viewed, along with technical training, as factors which shape structural decisions in dental practice, which combine with patient characteristics to produce variation in service rates.[8]

Variation in service rates provides impetus for investigation into appropriateness of care issues.[27] Some variation may be acceptable or desirable where it reflects uncertainty over effectiveness of alternative treatments, dissemination of innovations or underlying variation in population health status.[28] However, there is a recognition that few criteria are available for evaluating overall treatment strategies and that decisions related to choice of treatment are complex, inadequately defined and directly related to cost of care.[29]

The association of beliefs of dentists with service patterns may reflect a process which matches dentist practice beliefs with expectations of patients,[8] although patients may have limited information on which to make such choices.[30] Regardless of whether dentists and patients have similar beliefs, service patterns may be constrained by enabling mechanisms such as income or insurance cover to allow the desired service pattern to proceed. Such a view is consistent with the notion of negotiated treatment plans between dentist and patient.[31]

Practice beliefs provide one small to moderate source of influence on service provision. Their importance lies in adding to our understanding of how services vary, which needs to encompass a range of dentist, practice and patient factors. The appropriateness of care issues which emerge from the observed variation in service rates may need to be answered through objective assessments of the outcomes of currently adopted treatment strategies.

CONCLUSION

The factor structure of the practice beliefs of dentists was replicated in the Australian context, comprising IG, PO and PI scales. Practice beliefs had small to moderate associations with rates of service provision. Information giving was associated with a higher rate of crown and bridge and lower rates of extraction and prosthodontic services. Preventive orientation was associated with a higher rate of restorative and total services per visit. Patient influence was associated with a higher rate of preventive services but a lower rate of crown and bridge services. While the generality of these practice belief factors was enhanced due to their replication in Australia, the scales may be under-identified and require more items to improve their reliability and there is a need to assess their role in models of service provision which can account for other variables such as dentist, practice and patient factors.

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Address for correspondence/reprints:
Professor AJ Spencer
Department of Dentistry
Adelaide University
South Australia 5005