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Improving oral-health-related quality of life: findings from an in-school toothbrushing programme

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Abstract

Background and objectives: Inequalities in oral health among New Zealanders persist, with Māori and poor families experiencing a high proportion of oral disease, which manifests mainly as dental decay. Dental caries experience in Northland children is the highest in the country, and there is no fluoridated water supply. The aim of this study was to determine whether a supervised toothbrushing programme can improve oral health-related quality of life.

Methods: This was a quasi-experimental study involving 335 10-13-year-old New Zealand children with high caries experience from 5 Northland schools. All children completed an oral health-related quality of life questionnaire (the CPQ₁₁₋₁₄) at baseline. Half of the children (those from Kaitiāia Intermediate; N = 159) participated in a supervised toothbrushing session each school day, and the remainder served as the control group (N = 176). Questionnaires were completed again at the end of the school year, 9 months later. Effect sizes were calculated based on the change in oral health-related quality of life from baseline to follow-up.

Results: An in-school supervised toothbrushing programme was successfully implemented. Children in the toothbrushing group had higher CPQ₁₁₋₁₄ scores (representing poorer OHRQoL) at baseline than those in the control group (13.6 and 12.7, respectively). At follow-up, they had lower scores than those in the control group (9.4 and 10.6, respectively; P < 0.001; effect size = 0.4). Overall, OHRQoL improved for both groups, but the largest improvement was observed among those in the toothbrushing group, with a moderate effect size.

Conclusion: A supervised toothbrushing programme successfully implemented in a Northland school led to improved oral-health-related quality of life among participants.

have been designed with a biopsychosocial health approach to capture information on people's symptoms, physical functioning, and emotional and social well-being to facilitate understanding of people's evaluations of their oral health. Child OHRQoL measures have received considerable focus in the last two decades, with New Zealand research contributing substantially to that work. A number of studies have shown that the Child Perceptions Questionnaire (CPQ₁₁₋₁₄) measure is valid and reliable among New Zealand children (Foster Page *et al*, 2005; Foster Page *et al*, 2008; Foster Page *et al*, 2010; Foster Page *et al*, 2011; Foster Page *et al*, 2013; Foster Page *et al*, 2014; Thomson *et al*, 2016). Strong evidence exists that children with higher caries experience have poorer OHRQoL (Jokovic *et al*, 2002; Li *et al*, 2008; Nunez *et al*, 2015; Kumar *et al*, 2016).

Toothbrushing programmes have been shown to improve the oral health of children using standardised clinical measures such as the DMFT index (Curnow *et al*, 2002; Jackson *et al*, 2005; Macperson *et al*, 2013; Rong *et al*, 2003; Wolff *et al*, 2016). Given this, and the strong and consistent evidence that children with higher caries experience have poorer OHRQoL (Jokovic *et al*, 2002; Li *et al*, 2008; Nunez *et al*, 2015; Kumar *et al*, 2016), it is somewhat curious that, to date, there have been no published reports on whether a supervised toothbrushing programme improves children's OHRQoL. However, findings from an Irish study suggest that it might. A home-based toothbrushing programme ('Winning smiles') involved 200 children from schools in areas of high deprivation who were each given a brush and fluoride toothpaste and encouraged to use them to brush their teeth at home (Freemana *et al*, 2006). The children received oral health education aimed at improving their brushing technique. OHRQoL data were collected (using the CPQ₈₋₁₀) at baseline and at follow-up (one year later). The intervention led to a statistically significant improvement in toothbrushing and fluoride toothpaste knowledge, and an improvement in OHRQoL scores was observed (but just failed to reach statistical significance), suggesting that tooth-brushing educational intervention may have a positive effect on behaviour and on OHRQoL.

While there have been many school-based toothbrushing trials previously conducted internationally, there have been only small-scale, unevaluated, and ultimately unsustainable toothbrushing projects conducted in New Zealand. A small-scale pilot study was conducted in Northland at Opononi Area School with 30 6- to 8-year-old primary school children from 2008

Introduction

Oral health inequalities persist in New Zealand, with Māori and poor families experiencing a high proportion of oral disease, mainly dental decay. The Northland population has high proportions of Māori and a high number of the population reside in deprived areas. Dental caries experience in children in Northland is the highest in the country, and there is no fluoridated water supply (www.health.govt.nz).

Health is a subjective state (World Health Organization, 2015), and so measuring it requires assessment of the social and emotional aspects, not just disease status. Oral health-related quality of life (OHRQoL) measures

to 2011 (Gowda *et al*, 2011). Teachers were responsible for supervising daily tooth-brushing after lunchtime, and dental therapists provided oral health education and collected the clinical data (using the Plaque Index and Gingival Index). Qualitative data were collected; focusing on the teachers' and dental therapists' experiences and perceptions before, during and at the end of the trial. The mean Plaque Index score was 1.5 at baseline and 0.7 at follow-up (Silness and Loe, 1964 Plaque Index), with a similar positive outcome in gingival scores. The pilot study's main finding was the reliance on the multiple classroom teachers' initiative in having the tooth-brushing sessions after lunchtime. The brushing was inconsistent because teachers were often too busy to implement the brushing programme. Although the brushing was irregular, there appeared to be a positive clinical outcome. Teacher feedback covered problems with toothbrush storage and the need for good-quality toothbrushes (because some broke) and effective organisation. By the second year of the trial, teachers commented that tooth-brushing had become routine and children were reminding teachers about the brushing sessions after lunch. This pilot study showed that the tooth-brushing programme was successful in improving the cleanliness of the teeth and the health of the gums. The trial made toothbrushing with a fluoride toothpaste routine for those rural, highly deprived, predominantly Māori primary school children residing in a non-fluoridated community. The success of such a programme depends on the clinicians, school staff, parents and children all being involved and engaged in planning and running the programme from its commencement.

Another Northland toothbrushing study involved a total of 240 children in four primary schools, with teacher-led daily brushing sessions in school, along with oral health education and the advertising of free dental services. Running for a year, the study had a high drop-out rate and no means of formal evaluation. Feedback indicated that it relied on the teachers to conduct the brushing sessions, with some more enthusiastic than others. A recommendation from that project was that, for the long-term sustainability of a programme, it is important to have support from teachers and the community rather than just the principal and oral health promotion team leading and running the project (Ali and Dones, 2013).

It appears that school toothbrushing programmes may be effective in deprived areas where dental caries rates are high, but a current lack of evidence on whether they improve children's OHRQoL may be hampering efforts to implement such programmes on a larger scale. Accordingly, the aim of this study was to determine whether a supervised toothbrushing programme can improve OHRQoL in Northland children.

Methods

This quasi-experimental trial was set up to include children from five Northland Intermediate schools. Ethical approval for the study was obtained from the Northern A Health and Disability Ethics Committee (14/NTA/176). Children (with consent to take part) had dental examinations and filled in a questionnaire at

the start of 2015 and at the end of the 2015. Collected sociodemographic information included age, sex and ethnicity. Children from five schools were assessed, with four as control schools and Kaitaia Intermediate the designated intervention school. The toothbrushing programme was implemented in the latter at the beginning of 2015.

Toothbrushing programme

It was necessary to appoint a research supervisor to run the toothbrushing programme at Kaitaia Intermediate. An existing teacher aide—who worked part-time within the school, had an interest in oral health and was familiar with Te Reo, working in both English and bi-lingual classrooms—was appointed to the role in January 2015 before the school term began. Thorough consultation with all stakeholders was undertaken to discuss how the toothbrushing programme would be implemented and run.

The research supervisor was present after lunchtime to run the daily toothbrushing sessions. She was also responsible for packing up and keeping the brushing area tidy, ordering further supplies and ensuring that cross-infection control standards were maintained. Children were given a labelled toothbrush, toothpaste and case to use at school. This was stored and looked after by the research supervisor. The brushing took place in the classroom or on a sheltered deck area directly outside the classrooms. The children were taught the modified Bass technique and were timed for 2 minutes by the supervisor in brushing their teeth, after which they spat into a clean paper towel which was then discarded. The children did not rinse the toothpaste off after brushing. The supervisor was also responsible for recording their attendance in the programme. Any children who were not present for 80% of the toothbrushing sessions were excluded from the study.

OHRQoL measure

OHRQoL was measured using the short-form 16-item CPQ₁₁₋₁₄; this was completed by participants at baseline and at follow-up. The CPQ₁₁₋₁₄ has 16 items which comprise the two domains of 'symptoms/function' and 'well-being' (Thomson *et al*, 2016). Response options and scores for each item were: "Never" (scoring 0); "Once or twice" (1); "Sometimes" (2); "Often" (3); and "Every day or almost every day" (4). An overall CPQ₁₁₋₁₄ score was computed by summing the appropriate item scores for each measure, with a higher score indicating poorer OHRQoL. Internal consistency reliability (Cronbach's alpha) was examined prior to the computation of scale and subscale scores.

Two global oral health questions were also used. First, children were asked to rate the health of their teeth, lips, jaws and mouth (response options: 'Very good', 'Good', 'OK' or 'Poor'). Second, they were asked how much their teeth, lips, jaw or mouth affects their life overall (response options: 'Not at all', 'A little bit', 'Some' or 'A lot').

Test-retest reliability was examined with 38 and 28 children (respectively) repeating the questionnaire two weeks later at baseline and follow-up. Test-retest reliability for the CPQ₁₁₋₁₄ was assessed by scrutinising



intraclass correlation coefficients (ICC). The ICC was calculated as the proportion of total variance in the measure (participant variability) that was due to the true differences between responses to the initial and repeated questionnaires. At baseline, the Cronbach's alpha values were 0.80, 0.62 and 0.75 for the CPQ₁₁₋₁₄, symptoms and well-being domains, respectively. At follow-up, Cronbach's alpha values were 0.82, 0.59 and 0.68 for the CPQ₁₁₋₁₄, symptoms and well-being domains, respectively. These indicate substantial internal consistency reliability for the total CPQ₁₁₋₁₄, although the symptoms domain was not as high as the well-being domain (but still within an acceptable range).

Follow-up OHRQoL data were analysed by calculating the change in score between the baseline and follow-up data for each domain and the total CPQ₁₁₋₁₄ scores. Effect sizes were computed by dividing the mean change score by the standard deviation of the mean pre-treatment score, giving a dimensionless measure of effect. Effect sizes of less than 0.2 indicate a small clinically meaningful magnitude of change, 0.2 to 0.7 a moderate change, and greater than 0.7 a large change.

Results

Of the 487 eligible schoolchildren aged 10 to 13 years (school years 7 and 8), 335 (68.8%) returned completed parental consent forms and assented to take part in the study. Kaitaia Intermediate school served as the intervention school and the remaining four schools (Bream Bay, Dargaville, Kaikohe and Raurimu Ave) made up the control group. There were 159 children in the intervention group and 176 in the control group. The schools had varying participation in the study, with Dargaville having the highest participation rate (80%) and Kaikohe having the lowest rate (56%).

The sociodemographic characteristics of the baseline sample are presented by school in Table I. There was a significantly greater number of younger and Non-Māori children in the control group.

The baseline mean CPQ₁₁₋₁₄ and domain scores are presented by responses to the global oral health questions in Table II. There was a distinct gradient in mean CPQ₁₁₋₁₄ (and domain) scores across the categories of self-rated oral health, whereby those who rated their oral health as 'poor'/'fair' had the highest score, and those with excellent

Table I Sociodemographic characteristics of children in the control and intervention groups

Characteristic	Control N (%)	Intervention N (%)	Total Number N (%)
Total	176 (52.5)	159 (47.5)	335 (100.0)
Sex			
Male	88 (50.0)	85 (53.5)	173 (51.6)
Female	88 (50.0)	74 (46.5)	162 (48.4)
Age			
10-11	131 (74.4) ^a	89 (56.0)	220 (65.7)
12-13	45 (25.6)	70 (44.0)	115 (34.3)
Ethnicity			
Non Māori	71 (40.3) ^a	42 (26.4)	113 (33.7)
Māori	105 (59.7)	117 (73.6)	222 (66.3)
Deprivation			
High	127 (74.7)	126 (81.3)	253 (77.8)
Medium	35 (20.6)	27 (17.4)	62 (19.1)
Low	8 (4.7)	2 (1.3)	1 (3.1)
School decile score			
1	72 (40.9)	159 (100.0)	231 (69.0)
2	6 (3.4)	-	6 (1.8)
3	-	-	-
4	60 (34.1)	-	60 (17.9)
5	38 (21.6)	-	38 (11.3)
School			
Bream Bay College	38 (21.6)	-	38 (11.3)
Dargaville Intermediate	60 (34.1)	-	60 (17.9)
Kaikohe Intermediate	72 (40.9)	-	72 (21.5)
Kaitaia Intermediate	-	159 (100.0)	159 (47.5)
Raurimu Ave School	6 (3.4)	-	6 (1.8)

^a p < 0.05

Table II Mean CPQ₁₁₋₁₄ and domain scores by global items (brackets contain SD)

	Overall		Subscale scores			
	CPQ ₁₁₋₁₄		Symptoms		Well-being	
Self-rated oral health						
Excellent/Very good	10.2	(7.7)	5.8	(4.3)	4.4	(4.6)
Good	13.7	(7.5)	7.5	(3.8)	6.2	(4.7)
Poor/Fair	16.3	(7.8)	8.5	(4.0)	7.7	(4.9)
Impact on quality of life						
Not at all	9.3	(6.4)	5.7	(3.8)	3.7	(3.8)
Very little	13.3	(6.9)	7.0	(3.5)	6.2	(4.5)
Some/ A lot/Very much	18.1	(8.4)	9.5	(4.4)	8.6	(5.1)
Overall	13.1	(8.0)	7.2	(4.1)	6.0	(4.9)

Table III Mean CPQ₁₁₋₁₄ and domain scores by sociodemographic characteristics and intervention group (brackets contain SD)

	Overall		Subscale scores			
	CPQ ₁₁₋₁₄		Symptoms		Well-being	
Sex						
Male	12.8	(8.1)	7.0	(4.2)	5.9	(5.0)
Female	13.4	(7.8)	7.3	(4.1)	6.1	(4.8)
Age						
10-11	13.0	(8.1)	7.2	(4.3)	5.8	(4.8)
12-13	13.3	(7.7)	7.2	(3.7)	6.2	(5.0)
Ethnicity						
Non Māori	12.6	(7.9)	7.1	(4.2)	5.5	(4.8)
Māori	13.4	(8.0)	7.2	(4.1)	6.2	(4.9)
Deprivation						
High	13.1	(8.0)	7.2	(4.2)	6.0	(4.9)
Medium	13.3	(7.6)	7.2	(3.9)	6.0	(4.6)
Low	12.1	(7.1)	6.5	(3.1)	5.6	(4.9)
Group						
Control	12.7	(8.6)	7.0	(4.3)	5.7	(5.2)
Intervention	13.6	(7.2)	7.4	(3.9)	6.2	(4.4)
Total	13.1	(8.0)	7.2	(4.1)	6.0	(4.9)

self-rated oral health the lowest. There was a similar gradient in mean CPQ₁₁₋₁₄ (and domain) scores across the categories of global oral health.

The baseline mean CPQ₁₁₋₁₄ scores are presented by sociodemographic characteristics and intervention group in Table III. There were no statistically significant differences in CPQ₁₁₋₁₄ scores at baseline.

Of the 335 children assessed at baseline, there were 95 (28.4%) who did not have follow-up examinations, giving a follow up rate of 71.6%. A comparison of mean CPQ₁₁₋₁₄ scores for children who were followed up and those who were lost to follow-up is presented in Table IV. The group who were lost to follow-up had significantly higher mean scores in both domains and for the overall CPQ₁₁₋₁₄.

Summary data on the change in CPQ₁₁₋₁₄ (for each domain and overall) for the intervention group and control groups are presented in Table V. Scores improved in both groups, but the effect sizes observed in the intervention

group were greater than those seen in the control group. Overall, the change in CPQ₁₁₋₁₄ scores from baseline to follow-up for all children was significant. The children in the toothbrushing group had the greatest improvement in OHRQoL. OHRQoL improved for all groups with the exception of those in the low deprivation group. There were 9 children in the low deprivation group with follow-up responses; they had a lower OHRQoL at follow-up and the effect size was moderate. Māori children and those in the highly-deprived group had an improvement in OHRQoL across both domains and in the overall CPQ₁₁₋₁₄. Children in the toothbrushing group had higher OHRQoL scores across all domains at baseline (poorer OHRQoL). At follow-up, all had lower scores than those in the control group. The overall OHRQoL improved for all groups, but the largest improvement was for those in the toothbrushing group, which showed a moderate effect.

**Table IV** Mean baseline CPQ₁₁₋₁₄ scores by follow-up status (brackets contain SD)

	Baseline		Followed up		Not followed up	
CPQ ₁₁₋₁₄	13.1	(8.0)	12.2	(7.6)	15.4	(8.4) ^a
Symptoms	7.2	(4.1)	6.9	(4.0)	8.0	(4.2) ^a
Well-being	6.0	(4.9)	5.4	(4.6)	7.5	(5.2) ^a

^a $p < 0.05$ **Table V** Mean overall and domain scores by group at baseline and follow-up, with effect sizes.

Group		Baseline		Follow-up			Effect size	Effect size description
		Mean score (SD)	Range	Mean score (SD)	Range	Change in score (SD)		
Control	CPQ	11.8 (8.0)	0-34	10.6 (7.4)	0-32	1.3	0.2	Small
	Symptoms	6.8 (4.1)	0-19	6.3 (4.1)	0-20	0.6	0.2	Small
	Wellbeing	5.1 (4.9)	0-21	4.4 (4.6)	0-22	0.7	0.1	Small
Intervention	CPQ	12.7 (7.3)	1-36	9.4 (6.8)	0-32	3.2 ^a	0.4	Moderate
	Symptoms	7.0 (3.9)	0-24	5.4 (3.7)	0-17	1.6 ^a	0.4	Moderate
	Wellbeing	5.7 (4.3)	0-19	4.1 (4.0)	0-16	1.5 ^a	0.4	Moderate

^a $P < 0.001$; Paired t-test**Table VI** Negative binominal regression model for follow-up CPQ score.

	Incidence Rate Ratio (IRR; 95% CI)		P value
Baseline CPQ score	1.045	(1.033, 1.057)	<0.001
Male ^a	0.910	(0.770, 1.076)	0.271
European ethnicity ^b	1.098	(0.918, 1.314)	0.304
High deprivation ^c	0.918	(0.750, 1.123)	0.404
Intervention group ^d	0.841	(0.709, 0.998)	0.048

^a Reference category = Female^b Reference category = non-European^c Reference category = Low deprivation^d Reference category = Control group

Table VI presents the outcome of the regression model for follow-up CPQ score, with baseline CPQ score, brushing group and selected sociodemographic characteristics as independent variables. It confirms that, after controlling for sex, ethnicity, deprivation and baseline CPQ, the intervention group had significantly lower follow-up CPQ scores, on average.

Discussion

This quasi-experimental study has demonstrated that a toothbrushing programme can be successfully implemented in a Northland Intermediate school, and that it was effective. Over a one-year period, OHRQoL improved more for children who took part in a supervised toothbrushing programme than for those who did not. Māori children had a large improvement in OHRQoL.

Before discussing the findings, the study's weaknesses and strengths will be considered. There are a number of weaknesses. The administrative complexities of running a school-based toothbrushing programme precluded our using the randomised control trial design, and we had to opt for a quasi-experimental design instead. This meant that the control and the intervention groups were not identical, with

the latter having more Māori and fewer 10-11-year-olds than the control group. Blinding was not used in the assessments or in the intervention: the children who took part in brushing every day at school knew they were part of the intervention, and the dental examiners were aware of group membership. Turning to the strengths, the respectable follow-up rate (72% after one year) is comparable to those seen in previous studies investigating supervised toothbrushing programmes (Rong *et al*, 2003; Jackson *et al*, 2005; Sitthisettapong *et al*, 2012). Rong *et al* had a follow-up rate of 70% in a two-year toothbrushing study with preschool children in China (Rong *et al*, 2003), while 72% was obtained in a 20-month toothbrushing trial with London primary school children (Jackson *et al*, 2005), and a toothbrushing trial with Thai preschoolers had a one-year follow-up rate of 77% (Sitthisettapong *et al*, 2012). Ideally, our rate would have been 100%, but people living in deprived communities frequently change residence, making high attrition rates likely in such studies (Bjerkset *et al*, 2009; Tambs *et al*, 2009; Gustavon *et al*, 2012). The attrition analysis showed that the children who were lost to follow-up had poorer clinical oral health and poorer OHRQoL, but that the loss to follow-up affected

both groups equally. We chose to use the short-form CPQ₁₁₋₁₄, a measure which has been validated in this age group in New Zealand and shown previously to have performed well in a predominantly Māori Northland population with high caries experience (Foster Page *et al*, 2011). We also used the recently updated subscale structure—involving the ‘symptoms/function’ and ‘well-being’ subscales (Thomson *et al*, 2016)—for the domain analyses rather than the previously accepted four, and this would have ensured greater statistical power for the subgroup analyses. The two-factor CPQ₁₁₋₁₄ measure was found to have acceptable validity and internal consistency reliability in the current study, with higher mean scores in those who reported poorer oral health, and Cronbach’s alpha values falling within the acceptable range at baseline and follow-up (Tavakol and Dennick, 2011). Test-retest reliability was also excellent.

To date, there have been few studies reporting on the evaluative properties of the CPQ₁₁₋₁₄, and none investigating whether a supervised toothbrushing programme improves children’s OHRQoL. A longitudinal study of 255 Taranaki adolescents found the CPQ₁₁₋₁₄ to be responsive with a clinically meaningful change of 4 scale points (Foster Page *et al*, 2010). Basic dental treatment in Cambodian children has also been shown to improve OHRQoL, with a small effect size found following care (Turton *et al*, 2014).

While the current study showed an overall improvement in mean CPQ₁₁₋₁₄ and domain scores for children in both groups, the effect size was moderate in the intervention group but only small in the control group. Māori children had a larger improvement than NonMāori in the CPQ₁₁₋₁₄ overall, and they had a greater improvement in the ‘symptoms’ domain. The CPQ₁₁₋₁₄ was found to be a responsive measure which was able to detect a change in OHRQoL arising from a toothbrushing intervention. In other words, children’s OHRQoL improved significantly with a simple 2-minute supervised brushing programme at school. There was also an improvement in OHRQoL in the control group. This could be attributed to the Hawthorne effect; that is, children who knew they were part of a study could have altered their responses due to their awareness of being in it. The attrition analysis also showed that children with poorer oral health dropped out of the study, and this would have contributed somewhat to the apparent improvement in quality of life overall for both the control group and the intervention group.

Overall, the supervised toothbrushing programme was a success. Toothbrushing for 2 minutes each day has become a part of the school routine. Teachers appreciate the assistance from the supervisor, and commented that it ‘often brought the children back in from break times and was an activity to get their minds back on task’. Feedback from the evaluation forms was that the research supervisor was happy with the way the programme was running. Brushing was going well in class and the children were rinsing their brushes with the water fountains after they had finished cleaning their teeth. The research supervisor also requested additional oral hygiene instruction and support onsite from a registered dental therapist. Since education sessions

were not part of the intervention, this was unable to be provided outside of the regular visits made by a dental therapist on site. School teaching staff were all very positive about the way the programme was running. Toothbrushing was reported not to impact on learning time in the classroom. Minor changes were constantly made to ensure the trial was running smoothly.

A key issue found with previous toothbrushing programmes and pilot projects has been their sustainability. The earlier attempts in Northland reported a high level of school and classroom drop-out rate, with associated sustainability issues (Ali and Dones, 2013; Gowda, 2011). In the current study, there was funding available for the toothbrushing supervisor to conduct daily sessions, and so there was no issue with the programme ceasing due to a lack of enthusiasm. Toothbrushing became a part of the daily school routine. Supplies (such as tooth paste, brushes and paper towels) were readily accessible. There was also no reliance on commercial sponsorship or gifts of supplies. The supervisor maintained close contact with both staff at the school and researchers so that the programme continued, and stock was ordered in a timely fashion. These were crucial factors which substantially contributed to the success of this programme by one year after its inception. Future evaluation of this programme at 2 and 3 years is required to determine whether it can be sustained over a longer period.

Conclusion

This is the first study to show that an overall improvement in OHRQoL can occur in children who take part in a supervised toothbrushing programme. This programme has been the first large-scale, fully evaluated toothbrushing programme to be set up and run successfully in New Zealand. This study has shown that a programme can be successful, and it continues in Kaitia Intermediate to this day. With adequate support from the school, a programme such as this is easily implemented. It reinforces the need for policy to consider other approaches to improve children’s oral health in communities which experience high caries rates and poor oral health.

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News and comment

On 2 July the Dean, Professor Paul Brunton took up his new role as Pro-Vice-Chancellor of the Division of Health Sciences, replacing Professor Peter Crampton. Professor Alison Rich will be the Acting Dean until a further appointment is made.

Alan Laws MDS(NZ) FRACDS

Many readers will have fond memories of Alan Laws, who passed away this June in his 90th year. Alan retired in 1992 from his position as Associate Professor and Head of the Department of Periodontology, and pursued his interests in silversmithing and military history. At his specific request no obituary will appear in the Journal.