Evaluating the effectiveness of fluoride varnish in preventing caries amongst Long-Term Care Facility Residents

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Abstract: Objective To evaluate the effectiveness of professionally applied fluoride varnish on the incidence of dental caries amongst older adults resident in LTCFs in Northern Ireland. Background The oral health status of older adults within Long-Term Care Facilities (LTCFs) is significantly worse than their community living peers. Whilst evidence suggests an important role for fluoride varnish in preventing caries in this population, very few studies have evaluated this intervention. Materials and Methods A quality improvement project was undertaken with dentate residents (n = 190) in nine LTCFs who had fluoride varnish applied by Dental Care Professionals on two separate occasions during a 12-month period (intervention group). Nine LTCFs were chosen as matched controls (control group) with comparable numbers of residents of similar medical status (n = 217). For the intervention group, oral hygiene training was also provided for the care home staff. Results A total of 407 patients (n = 271 female) were included in the analyses (mean age [SD]: 84.1 [6.6] years). After 12 months, the intervention group recorded a significant reduction in mean number of carious teeth (mean [95% CI]: −0.85 [−1.12, −0.58]; P < .001). Patients in the control group had significant increases in the mean number of carious teeth (mean [95% CI]: 0.21 [0.05, 0.37]; P = .012), mean plaque score (mean [95% CI]: 1.16 [0.28, 2.04]; P = .010) and mean DMFT score (mean [95% CI]: 0.13 [0.04, 0.22]; P = .004). Conclusions This study demonstrates the potential role of fluoride varnish in combination with oral hygiene training for staff in the prevention and arrest of carious lesions among older adults in LTCFs.

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Abstract

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Conclusions: This study demonstrates the potential role of fluoride varnish in combination with oral hygiene training for staff in the prevention and arrest of carious lesions among older adults in LTCFs.

Keywords: ageing, caries, institutionalized elderly, oral health promotion
1 | INTRODUCTION

The World Health Organisation (WHO) has projected a rapid worldwide increase in the number of older people, defined as those aged 65 years and over, from approximately 5.24 million in 2010 to almost 1.5 million by 2050.1

These changing population demographics are accompanied by concurrent trends of increased retention of natural teeth among older adults.2 3 In 1979, 33% of the Northern Irish adult population were edentulous, compared to an estimated 4% in the most recent UK Adult Dental Health Survey.2 Edentulism among adults aged seventy-five and over has fallen from 74% to around 40% within the same period.3 Increases in the number of natural teeth retained and the number of sound, untreated teeth have also been noted, with more pronounced improvements identified among older age groups. While these developments enable a greater proportion of adults to preserve a lifetime functional dentition, significant challenges exist in maintaining this dentition against the background of chronic dental diseases.4

This holds true, in particular, for older adults residing in Long-Term Care Facilities (LTCFs). The annual dental caries increment among LTCF residents is more than double that of equivalent community-dwelling older adults, whilst for those suffering from dementia, it is more than twice the rate again.5 In the United Kingdom, it is reported that more than half of older adults who live in LTCFs experience dental caries, in comparison to 40% of over 75s who live independently.6 There is now acknowledgement of the inequalities in oral health provision experienced by LTCF residents, accompanied by calls for immediate action by relevant stakeholders to address these disparities.7

Within the United Kingdom, the National Institute for Health and Care Excellence (NICE) publishes evidence-based guidelines on all aspects of health care. In 2016, NICE published “Oral health for adults in care homes (NG48)” which included a series of recommendations for LTCFs including improving access to dental services for LTCF residents, improving the oral health knowledge and skills of care home staff and the implementation of oral health assessments, mouth care plans and daily oral care for all residents.8 Whilst the guideline development committee reviewed all available evidence on oral health of LTCF residents, they acknowledged a lack of good quality data on the effectiveness of oral health interventions for LTCF residents and identified this as a priority area for future research.

The role of fluoride in the prevention of dental caries and the mechanisms through which this preventative effect is achieved have been well described; however, the vast majority of studies investigating the effects of fluoride interventions have been carried out in children.9 10 Studies including adults have shown that fluoride is an effective caries preventative measure across all age groups, whilst a review of fluoride interventions to prevent root caries in adults found that the regular application of topical fluoride was effective in achieving this.10 Older people residing in LTCFs represent a group with distinct characteristics including multiple comorbidities, xerostomia, polypharmacy and limited self-care abilities.11 Given the obvious differences between the groups involved, difficulties exist in simply extrapolating the results of previous studies on fluoride efficacy to older adults residing LTCFs.

Therefore, the aim of this study was to evaluate the effectiveness of fluoride varnish application in the prevention of dental caries, for older people in LTCFs in Northern Ireland. This study was undertaken as a Quality Improvement (QI) Project which is a systematic, formal approach to improve the ways that care is delivered to patients. Within the National Health Service (NHS) in the United Kingdom, there is an expectation that all clinicians engage in QI activity. In this project, an extended preventative programme, including the application of fluoride varnish to the teeth of eligible patients by Dental Care Professionals (DCPs) and education for care home staff, was evaluated.

2 | METHODOLOGY

The Community Dental Service (CDS) provides dental services to patients unable to access treatment within primary dental care as a result of disability, complex medical conditions, mental illness, anxiety, behavioural problems or a physical inability to access services. These services include the provision of dental care to patients’ resident within LTCFs throughout Northern Ireland. Beginning in 2017, the CDS was allocated additional funding by the Department of Health, Northern Ireland, to pilot an Oral Health Prevention Programme for dentate adults in LTCFs as part of a QI programme. LTCFs within the geographical area served by the Western Health and Social Care Trust in Northern Ireland were invited to participate in this QI programme.

2.1 | Inclusion and exclusion criteria

Nine LTCFs agreed to be part of the QI project. All residents within these LTCFs were patients who were already receiving oral health care from the CDS. All dentate residents within the nine LTCFs who provided verbal consent for oral examination and the application of fluoride varnish were included (n = 190). Edentulous residents (n = 121), those unable to co-operate or provide consent for examination or fluoride varnish application, were excluded (n = 44). Residents who were unable to consent and had no registered power of attorney were deemed to have not consented and were therefore excluded. Residents with a medical history which precluded the application of fluoride products or those with facial or oral infections were also excluded (n = 1).

2.2 | Delivery of the intervention

Oral health assessments of the residents within the nine LTCFs recruited to the QI project were carried out by three calibrated senior
dentists (Senior Dental Officers) from the CDS between January and February 2017 (CMG, JMG, GQ). This was a baseline assessment of oral health status with data collected including a plaque score and hard tissue charting to generate a Decayed, Missing, Filled Teeth (DMFT) Score.\textsuperscript{12} Assessments were carried out within the LTCFs with residents sitting in an upright chair and illumination provided by a mobile light. Data were collected on specifically designed data collection sheets, and all examinations were undertaken within the LTCFs. Treatment was provided for patients by the Senior Dental Officers to render the patients dentally fit at baseline.

The application of fluoride varnish to all remaining natural teeth (Duraphat Fluoride Varnish (22 600 ppm Sodium Fluoride), Colgate, New York, USA) for LTCF residents was carried out on two occasions by trained Dental Care Professions (DCPs) in March 2017 and September 2017. At each application, the teeth were professionally cleaned and dried prior to varnish application. The varnish application was provided within the LTCFs.

Training on oral hygiene, as well as basic screening of the oral tissues for potential abnormalities, was provided for the LTCF staff as part of the QI project by the DCPs at the same visit as they provided the first application of fluoride varnish in each LTCF. The training involved the delivery of a visual presentation, including intra-oral photographs, as well as practical training on assisted tooth brushing using models. A resource folder containing oral healthcare plans, advice sheets for carers and additional information on oral healthcare products was provided to the nine LTCFs at the time of the training to act as a reference guide for oral health provision.

The oral health assessments by the same three senior dentists from the CDS were repeated 12 months following the initial assessment. The assessment was undertaken according to the same clinical procedure described for the baseline assessment, and all examinations were undertaken within the LTCFs.

### 2.3 Control homes

In order to evaluate the intervention provided as part of the QI programme, the oral health of residents within the programme was compared to those in matched control LTCFs where the intervention was not delivered. This was made possible as the CDS was already routinely providing oral health assessments and oral health care in other LTCFs within the geographical area served by the Western Health and Social Care Trust in Northern Ireland. Nine LTCFs were statistically matched as controls where the intervention was not being delivered. Variables used to create the matched controls included the number of care home residents, geographical location according to postcode and medical status (including dementia status) of the residents.

In the matched LTCFs, oral health assessments of the residents were also carried out by the same three calibrated senior dentists (Senior Dental Officers) from the CDS between February and March 2017 (CMG, JMG, GQ). This was a baseline assessment of oral health status with data collected including a plaque score and hard tissue charting to generate a DMFT Score.\textsuperscript{12} Assessments were carried out within the LTCFs with residents sitting in an upright chair and illumination provided by a mobile light. Data were collected on specifically designed data collection sheets, and all examinations were undertaken within the LTCFs. Treatment was provided for patients by the Senior Dental Officers to render the patients dentally fit at baseline. All dentate residents within the matched LTCFs were included (n = 217) with only edentate residents (n = 151) and those unable to co-operate or provide consent for examination (n = 58) excluded.

None of the activities of the extended preventative QI programme were delivered within the control LTCFs as they continued to operate under usual practices during the 12-month period. The oral health assessments by the same two senior dentists from the CDS were repeated twelve months following the initial assessment. The assessment was undertaken according to the same clinical procedure described for the baseline assessment, and all examinations were undertaken within the LTCFs.

### 2.4 Data analysis

The data collected for each resident were anonymised, cleaned and entered into an electronic database in preparation for statistical analysis. All analyses were performed using SPSS version 25 (IBM). For continuous variables, independent samples t-tests were used to compare baseline characteristics (age, number of remaining teeth, plaque score, DMFT score and number of carious teeth). Chi-squared tests were used to compare categorical variables (gender). Paired samples t-tests were used to analyse within-group (intervention and control group) changes in oral health measurements (DMFT score, plaque score and number of carious teeth) from baseline to the 12-month follow-up visit. Between-group (intervention and control groups) differences in oral health measurements (DMFT score, plaque score and number of carious teeth) from baseline to the 12-month follow-up visit were investigated using Analysis of Covariance (ANCOVA). In each model, change in the oral health measurement from baseline to 12 months was the dependent variable. All models were adjusted for baseline measurement, baseline DMFT score, gender, age and number of remaining teeth at baseline. All analyses were undertaken using complete case and last observation carried forward (LOCF) (to deal with missing data) approaches.

Logistic regression was undertaken to determine the impact of fluoride varnish application on change in oral health measurements over 12 months. For each oral health measure (plaque score and number of carious teeth), participants were categorised into one of two groups: (a) improvement in oral health measure over 12 months and (b) oral health measure remained the same or deteriorated over 12 months. In each model, the oral health measure (with the two categories aforementioned) was the dependent variable and the study group (intervention and control groups) was the independent variable. Models were adjusted for age, gender, baseline number of remaining teeth and baseline DMFT score. Odd ratios and 95% CIs were calculated. None of the participants in either the intervention
or control group improved their DMFT score over the 12 months; therefore, logistic regression analysis was not undertaken with this variable.

### 2.5 Ethical considerations

Ethical approval was sought from the School of Medicine, Dentistry and Biomedical Sciences Research Ethics Committee at Queen’s University Belfast (QUB) in January 2017. The nature of this work, namely a QI project, was exempted from formal ethical approval. The project was registered as a QI project with the Western Health and Social Care Trust. Participation of residents in all LTCFs was voluntary, and informed consent was obtained from each resident. Residents who were unable to consent and had no registered power of attorney were deemed to have not consented. Information leaflets detailing the purpose of and the interventions involved in the QI project were provided for residents and their families.

### 3 RESULTS

A total of 407 older adults were included in the study (n = 217 in the control group; n = 190 in the intervention group). The entire patient sample was 71% (n = 291) female with a mean (SD) age of 84.1 (6.6) years. At 12 months, 43% of patients (n = 175) were lost to follow-up (intervention Group vs. control Group: 89 (46.8%) vs 86 (39.6%); P = .143). There were no substantial differences between those who attended the 12-month visit and those who were lost to follow-up in terms of age, gender and baseline plaque and DMFT scores. However, those who attended the 12-month visit had a higher number of remaining teeth (mean [SD]: 6.61 [1.50] vs 5.99 [1.34]; P < .001) and carious teeth (mean [SD]: 4.69 [1.38] vs 4.39 [1.23]; P = .026) at baseline compared to those who were lost to follow-up. There were no significant differences between the intervention and control groups at baseline in terms of age, gender and baseline plaque and DMFT scores. As also shown in Table 2, similar results were observed using LOCF approach for dealing with missing data (only lost to follow-up participants had missing data at 12 months).

The impact of fluoride varnish application on change in oral health measurements over 12 months is shown in Table 3. The intervention group was 14.74 times more likely to have a reduction in the number of carious teeth over 12 months than the control group (OR [95% CI]: 14.74 [5.89, 36.91]; P < .001) after adjusting for age, gender, number of remaining teeth at baseline and baseline DMFT score.

### 4 DISCUSSION

This analysis has demonstrated a statistically significant reduction (P < .001) in the incidence of carious lesions amongst dentate LTCF residents who received professionally applied fluoride varnish compared to LTCF residents in matched controls where usual care was provided. Despite the provision of oral health training for LTCF staff as part of the QI project, significant improvements in oral cleanliness as demonstrated by plaque scores were not observed after 12 months. Unfortunately, for the residents in the control group, where usual care was delivered, significant increases in carious teeth, plaque score and DMFT score were observed over 12 months.

While these findings suggest a potential role for the application of fluoride varnish as a caries preventative strategy for older adults in LTCFs, a number of limitations regarding the conduct of the study need to be acknowledged. The project was limited in scale to nine intervention LTCFs within one geographical area in Northern Ireland, plus matched controls, resulting in a small sample size and limited generalisability of the findings. Over-interpretation of the data collected should be avoided as relatively

### TABLE 1 Characteristics of patients included within the study at baseline

| Variable                  | Intervention group (n = 190) | Control group (n = 217) | P Values |
|---------------------------|-----------------------------|------------------------|----------|
| Gender (Female)           | 131 (68.9)                  | 160 (55.0)             | .286     |
| Age (Y)                   | 83.77 (6.87)                | 84.41 (6.37)           | .330     |
| Number of teeth           | 6.14 (1.43)                 | 6.53 (1.47)            | .008     |
| Plaque score              | 88.97 (13.97)               | 91.17 (10.78)          | .080     |
| DMFT score                | 21.49 (3.62)                | 21.87 (3.04)           | .261     |
| Number of carious teeth   | 4.65 (1.27)                 | 4.48 (1.37)            | .215     |

Note: Data presented as mean (SD) or frequency (%). Differences between the intervention and control groups were analysed using independent samples t-test for continuous variables and Chi-squared test for categorical variables.
Reduction in plaque score programme to improve the oral health status of residents in three develop, pilot and evaluate a comprehensive oral health prevention project and not as a result of a strictly controlled research project presented have been generated from the opportunity to evaluate a QI given the LTCF setting. It should also be noted that the data pre-

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Where data on a number of potentially important variables in clud-

lost to follow- up) was noted amongst participants both wit hin the number of participants. In addition, a high rate of attritio

A similar project, under-

Although research on the effectiveness of fluoride varnish ap-

A scoping review by Raghoonandan et al

TABLE 2 Oral health outcome differences between intervention and control groups

| Oral health outcome | Study group | Baseline Mean (SD) | Mean change from baseline (95% CI)a | Mean difference between groups (95% CI)b | P value |
|---------------------|-------------|-------------------|-------------------------------------|-----------------------------------------|--------|
| No. of carious teeth | Intervention (n = 101) | 4.65 (1.27) | -0.85 (-1.12, -0.58) | -0.93 (-1.15, -0.71) | <.001 |
| Control (n = 131) | 4.48 (1.37) | 0.21 (0.05, 0.37) | -1.80 (-3.00, -0.60) | .003 |
| Plaque Score | Intervention (n = 101) | 88.97 (13.97) | -0.06 (-1.13, 1.01) | -0.06 (-0.18, 0.06) | .318 |
| Control (n = 131) | 91.17 (10.78) | 1.16 (0.28, 2.04) | -0.04 (-0.10, 0.03) | .297 |
| DMFT Score | Intervention (n = 101) | 21.49 (3.62) | 0.10 (0.03, 0.17) | 0.12 (0.03, 0.22) | <.001 |
| Control (n = 131) | 21.87 (3.04) | 0.13 (0.04, 0.22) | -0.06 (-0.18, 0.06) | .003 |

*Within group differences analysed using paired samples t-test and only significant results are presented.

Differences between control and intervention groups were analysed using ANCOVA, adjusting for baseline measurements and gender, age and number of teeth at baseline.

Adjusted for baseline DMFT score also. Abbreviations: DMFT, decayed, missing and filled teeth; LOCF, Last observation carried forward.

* P <.05; ** P <.01; *** P <.001.

TABLE 3 The impact of fluoride varnish application on change in oral health measurements over 12 months

| Study Group | Reduction in no. of carious teeth n (%) OR (95% CI) P | Reduction in plaque score n (%) OR (95% CI) P |
|-------------|------------------------------------------------------|------------------------------------------------|
| Intervention (n = 101) | 40 (40) 14.74 (5.89, 36.91) <.001 | 13 (13) 2.46 (0.94, 6.45) .067 |
| Control (n = 131) | 15 (12) Ref | 8 (6) Ref |

Note: Data analysed using logistic regression and presented as odds ratio and 95% CIs. Models adjusted for age, gender, number of remaining teeth at baseline and baseline DMFT score.

care homes in the Westminster area of London. In addition to a baseline oral care survey of the care homes involved, the programme involved the coproduction of a training package for care home staff and the implementation of a fluoride delivery programme for res-

Although research on the effectiveness of fluoride varnish application in caries prevention among older adults in LTCFs is lim-

A similar project, undertaken by Public Health England between 2014 and 2015, aimed to develop, pilot and evaluate a comprehensive oral health prevention programme to improve the oral health status of residents in three care homes in the Westminster area of London. In addition to a baseline oral care survey of the care homes involved, the programme involved the coproduction of a training package for care home staff and the implementation of a fluoride delivery programme for res-

A scoping review by Raghoonandan et al aimed to examine the literature on the use of fluoride varnish in elderly people living
in long-term care facilities found that the application of fluoride varnish demonstrated effectiveness in controlling coronal and root caries, although it was less efficient in those with poor oral hygiene. The study concluded that further research on methods to improve the oral hygiene of older LTCF residents, as well as improved collaboration between LTCF and oral health professionals was necessary to maximise the effectiveness of fluoride delivery as a caries preventative strategy. The statistically significant reduction in the incidence of carious teeth observed in this analysis occurred despite generally poor levels of oral hygiene. This would suggest that an even greater reduction could be achieved through the application of fluoride varnish, if effective oral hygiene practices were also implemented.

A recent report published in July 2019 by the Care Quality Commission "Smiling matters: oral health in care homes" reviewed 100 care homes in England and concluded that the majority of people living in care homes were not being adequately supported to maintain and improve their oral health. The report found that 73% of care plans did not or only partly addressed oral health, while 52% of care homes did not have an oral care plan for residents and 47% of care home staff had not received any oral health training. The findings of this study identified poor levels of oral hygiene among LTCF residents in both intervention and control groups, with high plaque scores recorded for the majority of participants at both baseline and follow-up oral health assessments. This occurred despite the delivery of oral health training for care home staff among the intervention group, as part of the wider QI project. While the oral healthcare training of care home staff has been rightly identified as a priority area, this finding suggests that careful consideration should be given to underlying factors that may prohibit the success of this approach, as an isolated measure. High staff turnover, in combination with staff shortages, a reluctance among care home staff to undertake oral hygiene practices for residents, and a lack of understanding regarding the importance of oral health and its impact on general health have been cited as barriers to the provision of effective oral care in care homes. In addition, the importance of high levels of dietary intakes of refined carbohydrates by dentate residents within LTCFs cannot be overstated.

5 | CONCLUSIONS

This study has provided encouraging evidence on the effectiveness of professionally applied fluoride varnish in combination with a staff training programme on caries incidence amongst LTCF residents. A statistically significant reduction in mean numbers of carious teeth was observed between baseline and 12-month follow-up for patients who received two applications of fluoride varnish compared with controls who did not (P < .001). The study outcomes should be interpreted with caution given the manner of data collection and the high rates of patients lost to follow-up. Further attention still needs to be drawn to providing effective training packages for LTCF staff as oral cleanliness did not improve for residents despite training being provided.

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CONFLICT OF INTEREST

The authors do not report any conflicts of interest.

AUTHOR CONTRIBUTIONS

EJ, NK, ANI and SW analysed data and contributed to writing the manuscript. CMG, JMG and GQ collected data and contributed to writing the manuscript. MS and GMK designed the study, analysed data and contributed to writing the manuscript. All authors edited and approved the final version of the manuscript before it was submitted to Gerodontology.

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REFERENCES

1. World Health Organisation WHO Global Report. Noncommunicable diseases by country profiles 2018. New York: World Health Organisation; 2018.
2. Steele JG, Treasure ET, O’Sullivan I, Morris J, Murray JJ. Adult Dental Health Survey 2009: transformations in British oral health 1968–2009. BDJ. 2012;213:523-527.
3. Whelton H, O. M. D., Crowely E, Woods N, Kelleher V, Guieny H, Byrtek M. Oral Health of Irish Adults. 2000-02. Dublin, Department of Health and Children, 2007.
4. Hayes M, DaMata C, Tada S, et al. Risk indicators associated with root caries in independently living older adults. J Dent. 2016;51:8-14.
5. Karki AJ, Monaghan N, Morgan M. Oral health status of older people living in care homes in Wales. Br Dent J 2015;219:331-334.
6. National Institute of Health and Care Excellence. National Institute of Health and Care Excellence. Improving oral health for adults in care homes. 2016.
7. The Royal College of Surgeons of England. The Faculty of Dentistry of the Royal College of Surgeons of England. Improving older people’s oral health. 2017.
8. Marinho VC, Higgins JP, Shipham A, Logan S. One topical fluoride (toothpastes, or mouthrinses, or gels, or varnishes) versus another for preventing dental caries in children and adolescents. Cochrane Database Syst Rev. 2004;2004(1):CD002780.
9. Hardman MC, Davies GM, Duxbury JT, Davies RM. A cluster randomised controlled trial to evaluate the effectiveness of fluoride varnish as a public health measure to reduce caries in children. Caries Res. 2007;41(5):371-376.
10. Griffin SO, Regnier E, Griffin PM, Huntley V. Effectiveness of fluoride in preventing caries in adults. J Dent Res. 2007;86:410-415.
11. Pretty IA. The life course, care pathways and elements of vulnerability. A picture of health needs in a vulnerable population. Gerodontology. 2014;31:1-8.
12. O’Leary TJ, Drake RB, Naylor JE. The plaque control record. J Periodontol. 1972;43:38.
13. Ekstrand K, Martignon S, Holm-Pedersen P. Development and evaluation of two root caries controlling programmes for home-based frail people older than 75 years. Gerodontology. 2008;25:67-75.
14. Schaeken MJM, Keltjens HMAM, Van Der Hoeven JS. Effects of fluoride and chlorhexidine on the microflora of dental root surfaces and progression of root-surface caries. J Dent Res. 1991;70:150-153.
15. Public Health England. Public Health England. Delivery of a fluoride varnish programme in care homes. 2017.
16. Raghoonandan P, Cobban SJ, Compton SM. A scoping review of the use of fluoride varnish in elderly people living in long term care facilities. Can J Dent Hygiene. 2011;45:217-222.
17. Care Quality Commission. Care Quality Commission. Smiling matter: Oral health care in care homes. 2019.
18. Villarosa AR, Clark S, Villarosa AC, et al. Promoting oral health care among people living in residential aged care facilities: Perceptions of care staff. Gerodontology. 2018;35:177-184.

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