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Co-development of a digital intervention to improve oral health for older people living with complex needs in the community: final report

Mitchell, G., Stark, P., Brown Wilson, C., Tsakos, G., Brocklehurst, P., Lappin, C., Quinn, B., & McKenna, G. (2024). *Co-development of a digital intervention to improve oral health for older people living with complex needs in the community: final report.*

Document Version:

Publisher's PDF, also known as Version of record

Queen's University Belfast - Research Portal:

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CO-DEVELOPMENT OF A DIGITAL INTERVENTION TO IMPROVE ORAL HEALTH FOR OLDER PEOPLE LIVING WITH COMPLEX NEEDS IN THE COMMUNITY: FINAL REPORT

To cite this report: Mitchell G, Stark P, Brown Wilson C, Tsakos G, Brocklehurst P, Lappin C, Quinn B, McKenna G (2024) Co-Development of a Digital Intervention to Improve Oral Health for Older People Living with Complex Needs in the Community: Final Report. Queen's University Belfast.

Project Team:

Principal Investigator:

- Dr Gary Mitchell MBE, Reader (Education), Queen's University Belfast:
Gary.Mitchell@qub.ac.uk

Co-investigators:

- Professor Gerry McKenna, Consultant in Restorative Dentistry at the Belfast Health and Social Care Trust and a Clinical Professor in Dentistry at Queen's University Belfast: G.McKenna@qub.ac.uk
- Dr Patrick Stark, Research Fellow, Queen's University Belfast: P.Stark@qub.ac.uk
- Professor Christine Brown Wilson, Professor (Education), Queen's University Belfast: C.BrownWilson@qub.ac.uk
- Dr Barry Quinn, Senior Lecturer (Education), Queen's University Belfast: Barry.Quinn@qub.ac.uk
- Mrs Caroline Lappin, Chief Dental Officer (NI): Caroline.Lappin@health-ni.gov.uk
- Professor Paul Brocklehurst, Professor in Health Services Research at Bangor University: P.Brocklehurst@bangor.ac.uk
- Professor Georgios Tsakos, Professor of Dental Public Health at University College London: G.Tsakos@ucl.ac.uk

External Collaborator:

- Melvin Bell, Director, Focus Games Ltd: Melvin@FocusGames.com

Background

Oral health represents a crucial aspect of an individual's overall health and well-being (Baiju et al., 2017). The mouth and teeth play integral roles in essential human functions such as eating, smiling, and speaking (Baiju et al., 2017). Despite its significance, oral conditions pose a substantial global public health challenge (Peres et al., 2019; Dye, 2017). These conditions, including dental caries, periodontal disease, tooth loss, and oral cancer, affect approximately 3.5 billion people worldwide and are largely preventable (Dye, 2017; Kassebaum et al., 2017). Poor oral health can result in mouth pain, discomfort, and difficulties in chewing food properly, thereby impacting an individual's general health (Peres et al., 2019). Moreover, chronic oral health issues are associated with systemic health problems such as frailty, diabetes, cardiovascular diseases, renal diseases, and respiratory diseases (Genco & Sanz, 2020; Romandini et al., 2021; Casanova et al., 2014; Desvarieux et al., 2013; Sharma et al., 2016).

Despite being recognised as a key priority, oral healthcare often remains neglected and is not a prominent focus in current health policy discussions (Watt et al., 2019; Benzian et al., 2011). As the largest group of healthcare providers, nurses have the potential to play a significant role in promoting oral health (Dolce, 2014). Nurses operate in contexts where they can conduct structured oral health assessments and implement practices to optimize oral care (Dolce, 2014). However, literature suggests that many nurses lack confidence in performing structured oral health assessments and promoting good oral health practices to patients (Quinn et al., 2020; Tabatabaei et al., 2020; Grant et al., 2021).

A recent report by the World Health Organization (WHO) highlighted that several million people receive care in their homes, with many having complex care needs (WHO, 2022). Community nurses play a crucial role in providing support to these individuals (Kuluski et al., 2017). Given the high risk of poor oral health among this population, it is essential that community nurses possess the necessary knowledge and competence to support patients in maintaining good oral healthcare (Reigle & Holm, 2016). However, the specific tailored approaches to support oral healthcare for people receiving community nursing remain unclear (Albrecht et al., 2016). It is therefore imperative to identify evidence-based interventions that can assist community nurses in optimizing oral care for individuals receiving care at home (McGrath et al., 2021; Abou El Fadl et al., 2016).

Phase 1

The first part of this project was to complete a scoping review of the international literature to examine current interventions that support community nurses in the provision of oral healthcare to people living at home. Within this aim, any intervention that supports community nurses across the lifespan would be considered. For example, those who typically deal with older people (e.g., district nurses) and nurses who visit children and infants (e.g., health visitors) in their own homes will be examined. Beyond this immediate aim of the review, the purpose of this review was to inform the design of a digital educational resource to be used by community nurses who care for people in their own home. A total of 2174 records from four databases were initially screened, with 2080 records excluded following abstract screening. Eventually, 9 papers were included in the final review after thorough assessment and evaluation.

The interventions identified in the included studies fall into two main categories: health visiting and home care. These interventions primarily involved registered nurses, although some also involved nursing assistants. The targeted populations encompassed children and older adults. In health visiting settings, interventions focused on educating parents or primary caregivers, emphasising aspects such as nutrition, oral health behaviours, and proper dental hygiene. Some interventions even involved nurses applying fluoride varnish to children's teeth. In home care settings, interventions aimed to improve home care workers' knowledge of oral health, assessment skills, and care planning, with a focus on when to refer patients to a dentist. Additionally, some interventions provided tailored nutrition and oral health advice to older adults receiving home care.

The outcomes reported in the studies varied widely. In health visiting settings, interventions showed promising outcomes for children, including higher rates of dental visits and lower levels of oral disease. In home care settings, improvements were observed in oral health-related quality of life and xerostomia symptoms among older adults. Furthermore, interventions led to increased oral health knowledge and skills among nurses and nursing assistants, facilitating better oral health care provision.

Analyses of changes to practice revealed that educational interventions for nurses resulted in improved oral health behaviours and practices, such as explaining toothbrushing techniques and making dental referrals. However, challenges such as staff turnover and time constraints were noted, highlighting the importance of incorporating digital learning and institutional support to enhance intervention effectiveness.

Overall, while there is promising evidence for the efficacy of oral health interventions in community nursing, there remains a significant gap in interventional research in this area. Moving forward, this review recommended that efforts should be directed towards implementing streamlined and digital education strategies to build the necessary capability in community nurses effectively. The findings of this review have been published here: Stark, P., McKenna, G., Wilson, C.B. et al. Interventions supporting community nurses in the provision of Oral healthcare to people living at home: a scoping review. *BMC Nursing* 21, 269 (2022). <https://doi.org/10.1186/s12912-022-01051-5>

Phase 2

Following the paucity of evidence that emerged from the scoping literature review, the next phase in this study was to conduct qualitative research to explore the experiences of community nurses in the delivery of oral health care for people living at home. The study utilised a grounded theory approach, conducting interviews with fifteen community nurses in across all four countries of the UK. Participants were recruited through professional nursing networks, ensuring active registration and employment as community nurses. Data collection involved one-to-one semi-structured interviews, with ethical considerations adhering to the Declaration of Helsinki. Data analysis followed constant comparative analysis, with coding stages of open, axial, and selective coding to identify core categories.

Four Categories (or themes) emerged from the data:

1. **Education:** Community nurses expressed satisfaction with oral health education during pre-registration but lacked post-registration development opportunities. Continuing education was limited, leading to gaps in knowledge and skills.

2. **Practice:** Oral health assessment was not routine in community nursing practice due to the absence of standardised tools. Community nurses often relied on domiciliary care workers for oral health support beyond their scope of practice.
3. **Confidence:** Low education levels correlated with reduced confidence in providing oral healthcare. Inconsistent practices were linked to varying confidence levels among community nurses.
4. **Motivation:** Limited collaboration with community dentists was reported, with only a few nurses having experience in liaising with them. Motivation to contact dentists was reactive and stemmed from patient needs like dental pain or denture issues.

The identification of a core category is a fundamental aspect within grounded theory methodologies, representing the culmination of data analysis. This core category serves as the keystone, encapsulating and integrating all facets of the dataset under scrutiny, thereby laying the groundwork for theory development. In the context of this study, '**uncertainty**' emerged as the pivotal core category, substantiated by its recurrent presence across the dataset, its central position within the study's framework, its interrelation with every facet under investigation, and its organic emergence from the dataset.

Examining community nurses' perceptions of their role in delivering oral healthcare to older individuals residing at home, the study revealed pervasive uncertainty across multiple dimensions. Firstly, in **education**, nurses expressed uncertainty regarding the adequacy of their training in oral healthcare and were unclear about avenues for further education. This uncertainty was compounded by conflicting perspectives on the necessity of additional training vis-à-vis the perceived foundational nature of oral healthcare within nursing practice. Secondly, uncertainties surrounding **practice** were evident, particularly concerning the integration of oral healthcare into the nursing process. The absence of standardised assessment tools and delineation of responsibilities vis-à-vis home care workers contributed to this uncertainty. Thirdly, **confidence** among nurses was undermined by uncertainties regarding collaborative engagement with oral health professionals, eliciting dental history from patients, and facilitating patient access to dental services. Additionally, nurses were uncertain about providing advice on modifiable lifestyle factors impacting oral health. Lastly, uncertainty extended to nurses' **motivation** to drive future changes in oral healthcare service delivery, with many expressing uncertainty about their capacity and inclination to effectuate change.

The second phase of the study highlighted the need for enhanced oral health education which promoted standardised assessment tools, the importance of interprofessional collaboration, and clear role delineation to improve oral health outcomes for older individuals receiving care at home. The findings of this research study can be found here: Mitchell, G., Stark, P., Wilson, C.B. et al. 'Whose role is it anyway?' Experiences of community nurses in the delivery and support of oral health care for older people living at home: a grounded theory study. BMC Nursing 22, 359 (2023). <https://doi.org/10.1186/s12912-023-01533-0>

Phase 3

Following the review of the literature and qualitative phase of study, the next step was to co-design the digital intervention. The co-development of the oral health digital intervention followed a systematic and collaborative co-design approach, which encompassed several structured steps in line with best practices in co-design methodology. Each step played a

vital role in crafting a comprehensive digital educational resource focusing on oral health that was informed by phase one and phase two data.

Step 1: Formation of the Co-Design Team

The co-design team consisted of over twenty individuals, representing diverse perspectives. This team included individuals with personal experiences related to oral health, caregivers, oral health specialists, dental students, representatives from oral health charities, and academic lecturers in nursing from various institutions. This multidisciplinary composition ensured a holistic approach to content development.

Step 2: Co-Design Workshops and Content Creation

Early in the process, the co-design team conducted workshops involving these stakeholders to identify unmet needs and essential topics for the oral health digital intervention. Thematic analysis of these workshops guided the initial structure and content of the intervention, ensuring it addressed the identified educational requirements effectively.

Step 3: Expert Advisory Team Involvement

The co-design team collaborated with an expert advisory team comprising individuals with diverse expertise, including academics, oral health professionals, and representatives from older person's charities. These interactions focused on refining content and scripts for the intervention, aligning it with the specific educational needs related to oral health.

Step 4: Integration of Personal Experiences

To enhance the authenticity of the intervention, individuals with personal experiences related to oral health were involved in the development of digital resource. These individuals shared their insights and experiences, which were integrated into the intervention to provide relatable and valuable perspectives from the standpoint of individuals dealing with oral health issues, caregivers, and oral health professionals.

Step 5: Development of Prototype 1

Synthesising insights from previous steps, a draft content structure for the intervention was created. The digital intervention was designed as an interactive platform, structured to cover various aspects of oral health. This included informative segments and interactive modules aimed at engaging users effectively.

Step 6: User Testing and Refinement

User testing was conducted to assess the acceptability and effectiveness of the intervention among target users. Community nurses (sample 1) and student nurses (sample 2) were given access to the digital intervention for a specified period, and feedback was collected through pre/post-test questionnaires and voluntary focus group participation. Analysis of the collected data identified areas for refinement, ensuring the intervention aligned with the educational goals related to oral health (see phase 4).

Step 7: Development of Final Intervention

Feedback from the user testing phase guided further refinements to the intervention content, structure, and presentation. These refinements were made collaboratively with the advisory group, ensuring that the final digital intervention effectively addressed the educational needs related to oral health and promoted awareness in this digital intervention.

Phase 4

Following the co-design of the digital intervention, this was tested and evaluated amongst 627 nursing students in Northern Ireland and 213 community nurses from across the UK. The research protocol for this study, along with the outcome measures used, can be found here: Stark, P., McKenna, G., Wilson, C.B. et al. Evaluation of a co-designed educational e-resource about oral health for community nurses: study protocol. *BMC Nursing* 22, 94 (2023). <https://doi.org/10.1186/s12912-023-01268-y>. The findings of our evaluation are noted below.

Quantitative Data: Community Nurses

We conducted an analysis to evaluate the impact of a digital intervention on community students' attitudes towards oral health care. Prior to analysis, pre- and post-test datasets were matched using email addresses as identifiers. All analyses were conducted using SPSS version 29. Total scores for each questionnaire sub-scale were calculated based on Likert scale responses, with higher scores indicating more positive attitudes. Descriptive statistics were performed to observe demographic details of the participant sample. A series of paired t-tests were conducted to examine changes from pre-test to post-test on all subscales, with Cohen's d calculated as a measure of effect size. A Bonferroni correction was applied to the alpha value to determine statistical significance.

We recruited 231 participants for the study, aiming to assess the impact of the digital intervention on attitudes towards oral health care. However, primary analysis was possible for 213 cases due to missing data. Missing data occurred when participants did not complete either the pre- or post-test measures or failed to provide a correct identifier for data matching. Most participants were female (82.0%), aged 21-30 (47.7%), and had six months or less experience providing care to patients in the community (45.5%).

Overall, participants demonstrated increased scores on the post-test measure compared to pre-test, indicating more positive attitudes towards oral health care. This increase was statistically significant ($p < .001$) for the overall questionnaire as well as three of the seven subscales: **access to dental services**, **oral health indicators**, and **perceived self-efficacy in oral healthcare**.

In summary, our findings suggest a positive impact of the digital intervention on community nurses' attitudes towards oral health care. Despite missing data for some cases, our analysis demonstrates significant improvements in attitudes following the intervention, particularly in key areas such as access to dental services and perceived self-efficacy in oral healthcare. These results highlight the potential effectiveness of digital interventions in promoting positive attitudes and behaviours related to oral health care among community nurses.

Quantitative Data: Pre-Registration Nursing Students

To sustain the digital intervention post-study, the team have taken steps to implement the intervention within a community nursing module at Queen's University Belfast. The goal of this was to provide pre-registration nursing students with a greater awareness and understanding of oral healthcare in the community and to encourage those students to

disseminate this resource while on placement in community settings in Northern Ireland. As part of this implementation, we carried out a separate evaluation with three cohorts of nursing students over an eighteen-month period.

This study recruited a total of 750 nursing students to participate in the evaluation of the digital intervention. Participants completed both pre-test and post-test questionnaires, allowing for the measurement of changes in attitudes over time. However, primary analysis was only possible for 627 cases due to missing data. Missing data occurred primarily when participants did not complete either the pre-test or post-test measures. Demographic details of the participants revealed that the majority were female (92.0%) and aged between 18 and 21 (64.9%).

Analysis of the pre-test to post-test changes in attitudes toward oral health care revealed several significant findings. Overall, there was a statistically significant mean increase in attitudes toward oral health care from pre-test to post-test, indicating a positive shift in participants' perceptions. This improvement was consistent across all subscales of the questionnaire, highlighting the comprehensive impact of the digital intervention on various aspects of oral health care attitudes. Specifically, participants demonstrated significant increases in **attitudes toward dietary intake, social and psychological outcomes, access to dental services, health behaviours, care providers' knowledge and skills, oral health indicators, and perceived self-efficacy in oral healthcare**. These findings suggest that the digital intervention effectively improved nursing students' attitudes toward oral health care across all questionnaire domains.

The study's results have important implications for educational interventions aimed at promoting oral health awareness among nursing students. By incorporating digital interventions into the curriculum, educational institutions can enhance students' understanding and attitudes toward oral health care, ultimately improving the quality of oral health education in nursing programmes.

Qualitative Data: Community Nurses

In the study, RE-AIM was used to inductively analyse the impact of a digital intervention for community nurses providing oral care to older people. The team were interested in understanding the implementation process and outcomes along the RE-AIM dimensions. Through qualitative data analysis, themes emerged that shed light on how the intervention influenced reach, effectiveness, adoption, implementation, and maintenance within the context of oral care for older individuals. This approach provided valuable insights from 16 community nurses that used the digital intervention. The findings are discussed below.

Reach:

In our interviews with community nurses about the digital intervention, we found a range of attitudes toward engagement with the resource. Some nurses expressed enthusiasm and willingness to engage with the digital intervention, recognising its potential to enhance their practice and improve patient outcomes. They appreciated the convenience and accessibility of the digital platform, which allowed them to access resources and information at their convenience, fitting into their busy schedules. However, other nurses cited time constraints

and competing priorities as barriers to their engagement with the intervention. They expressed concerns about balancing their clinical responsibilities with the additional time required for training and implementation of the digital tool. Despite varying levels of willingness to engage, it was evident that the reach of the intervention was influenced by factors such as workload and individual perceptions of its value in enhancing patient care.

Effectiveness:

Across our interviews, community nurses reported positive outcomes resulting from their engagement with the digital intervention. Many noted that the intervention led to tangible changes in their practice, such as conducting more comprehensive oral health assessments during patient visits. Nurses reported an increased awareness of the importance of oral health and its impact on overall health outcomes, leading to more proactive approaches in addressing oral health issues among their patients. Additionally, the digital intervention facilitated access to resources and information about community dental services, enabling nurses to better support their patients in accessing appropriate care. Furthermore, nurses reported integrating health promotion messages regarding dietary intake into their practice, contributing to a holistic approach to patient care. Overall, the effectiveness of the intervention was evident in the positive changes observed in nurses' practice and their increased confidence in addressing oral health issues among their patients.

Adoption:

Challenges related to the adoption of the digital intervention were also evident in our interviews with community nurses. Nurses highlighted barriers such as competing priorities, limited time for training, and a lack of organisational support for oral health education. Many community nursing staff indicated that oral health was not a priority in their training or practice, leading to a perception that additional training on oral health was unnecessary. Moreover, training initiatives were often coordinated by central teams, with oral health not being adequately addressed in training agendas. To improve adoption, nurses emphasised the need for sustained efforts to raise awareness about the importance of oral health among community nursing staff and to garner buy-in from managers and directors. Addressing these challenges will require a concerted effort to integrate oral health education into training programmes and to ensure organisational support for the adoption of digital interventions in community nursing practice.

Implementation:

During our interviews, community nurses identified several implementation challenges related to the fidelity of the digital intervention. Nurses reported differences in approaches to oral health assessment and management across different community nursing networks, reflecting the complexity of community nursing practice. For example, district nurses may be more familiar with linking patients to community dental services, while community learning disability nurses may face unique challenges in addressing oral health issues among their patients. While nurses expressed a desire for a uniform assessment tool and process, they recognised the limitations imposed by diverse protocols and practices in community nursing.

Despite these challenges, nurses emphasised the importance of the digital intervention in promoting best practices in oral health assessment and management across different community nursing contexts.

Maintenance:

In terms of maintenance, the usage of the digital intervention has been sustained in pockets of the study sites, with ongoing support from key stakeholders. Nurses reported positive outcomes resulting from the implementation of e-certification for participants, which facilitated revalidation and ongoing professional development. In the future, there is a desire to extend the resource to consider other settings such as hospitals, hospices, and care homes, as well as to expand the focus to include children's health promotion. Long-term maintenance efforts will require collaboration with universities and other agencies to ensure ongoing support and integration of oral health education into community nursing practice. Additionally, initiatives such as widespread dissemination via the RCN Older People's forum, RCN Community Nursing Forum and the Queen's Nursing Institute (QNI) may also provide opportunities for knowledge exchange and collaboration to support the maintenance of the digital intervention in community nursing practice in the future.

The project team is currently writing-up two findings' papers for publication focusing on the mixed-methods evaluation on community nurses and the quantitative evaluation on nursing students.

Conclusion

In conclusion, the findings from this funded study highlight the significance of addressing oral health within the community nursing context and the potential of digital interventions to support nurses in delivering effective oral healthcare to individuals living at home. Despite oral health's critical role in overall well-being, it often remains neglected in healthcare policy discussions. Community nurses, as frontline providers, have the potential to make a substantial impact on oral health outcomes, but they face challenges related to education, practice, confidence, and motivation. Through a robust research process involving literature review, qualitative interviews, co-design, and evaluation phases, this study has demonstrated the feasibility and effectiveness of a digital intervention in enhancing community nurses' knowledge, skills, and attitudes towards oral health care. The intervention has shown promising results in improving oral health assessment practices, promoting health promotion activities, and facilitating access to dental services among community nurses.

However, challenges remain in the adoption and implementation of digital interventions in community nursing practice. Addressing these challenges will require sustained efforts to raise awareness about the importance of oral health, integrate oral health education into training programs, and garner support from organizational leadership. Additionally, ensuring fidelity and adapting interventions to diverse community nursing contexts are essential for successful implementation. In the future, there is a need for continued collaboration and dissemination efforts to maintain the usage and effectiveness of the digital intervention in community nursing practice. Long-term maintenance efforts should involve collaboration with universities, professional organisations, and other agencies to ensure ongoing support and integration of oral health education into community nursing practice.

In summary, this study highlights the importance of addressing oral health within community nursing practice and highlights the potential of digital interventions to support nurses in delivering high-quality oral healthcare to individuals living at home. By addressing barriers to adoption and implementation and fostering collaboration across stakeholders, we can work towards improving oral health outcomes and enhancing the overall well-being of individuals receiving care in the community.

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