

Institution: University of Dundee		
Unit of Assessment: UoA 3 Allied Health Professions, Dentistry, Nursing and Pharmacy		
Title of case study: Addressing Priorities for Health through Dental Research		
Period when the underpinning research was undertaken: 2010-2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s): Jan Clarkson	Role(s) (e.g. job title): Professor of Clinical Effectiveness	Period(s) employed by submitting HEI: 1998-present
Period when the claimed impact occurred: 2013-2020		
Is this case study continued from a case study submitted in 2014? N		

1. Summary of the impact

The Dental Health Services Research Unit at Dundee has led three large-scale randomised controlled trials addressing areas of global and national priority in clinical dentistry. The research has provided an evidence-base for dental policy in Scotland and across the UK, with key partnerships enabling the implementation of evidence directly into clinical practice. National and international collaborations have provided evidence enabling safe dental care and increased patient access during the COVID-19 pandemic. Impacts include:

- sustained yearly reductions in dental antibiotic prescribing influencing global action on antimicrobial resistance
- generating new clinical trial and systematic review evidence contributing to national clinical guidelines
- informing strategic government planning for NHS dental services for dental recall and preventive periodontal treatment
- increasing safe patient access to dental care during the pandemic.

2. Underpinning research

Global priority: antibiotic prescribing

Antibiotic resistance is recognised by WHO as “one of the biggest threats to global health, food security and development” and the reduction of dental antibiotic prescribing is a key health priority for governments seeking to address this threat. The Dental Health Services Research Unit at Dundee, in partnership with NHS Education for Scotland (NES), delivers Scotland’s national clinical guidance through the Scottish Dental Clinical Effectiveness Programme (SDCEP **Director Clarkson**), which includes an embedded Scottish Government funded guidance implementation initiative: Translation Research in a Dental Setting (TRiADS) also led by **Clarkson**.

Between 2007-2011 TRiADS monitoring of routine prescribing data demonstrated that, despite SDCEP’s antibiotic prescribing guidance, antibiotic prescriptions increased by 55,000 (16%). In response to these findings, the Scottish Government commissioned TRiADS in 2012 to conduct a randomised control trial (RAPiD) involving all 2,700 dentists in Scotland, to evaluate the impact of audit and feedback (A&F) using linked routinely collected dental prescribing and treatment data **[R1]**. Following the conclusion of RAPiD in 2014, a 6% reduction in national prescribing rates was observed. Several strategies of delivering A&F were tested, including a persuasive message developed by TRiADS, using behaviour change theory which had the greatest impact **[R1]**. Findings from RAPiD’s process evaluation identified a number of intervention functions and intervention policy categories to further improve dentists’ antibiotic prescribing **[R2]**.

Evidence base to inform national strategies in dental healthcare

The provision of cost effective, safe, person-centred preventative healthcare is a primary objective of the UK Government. However, routine dental care lacks an evidence base to justify clinical strategy or funding. Six-monthly check-ups with a scale and polish (S&P) has been established practice for many since the start of the NHS and currently more than half the courses of dental care include a S&P. In Scotland alone the annual cost of check-ups and S&P's is £62million yet prior to this research there was insufficient evidence to inform policy makers, clinicians or patients.

INTERVAL and IQuaD were UK-wide, Dundee-led randomised control trials (RCTs) that directly addressed this gap in evidence. The UK-wide collaboration included 10 of the 13 UK dental schools and was supported by all four UK Chief Dental Officers (CDOs). The INTERVAL trial [R3] (2010-2018 £3.5M), conducted in 50 UK dental practices with 2,372 patients, found that a 24-month recall interval was not detrimental for patients at low risk of oral disease, and results supported a person-centred, variable risk-based recall interval. The IQuaD trial [R4] (2012–2017 £2.4M), conducted in 63 dental practices across the UK with 1,877 adult patients, employed a split-plot design combining cluster- and patient-level randomisation. The results found no clinical benefit of offering a S&P at six or 12-months compared with no S&P for regular attenders over a period of three years, nor was any clinical benefit of personalised over usual oral health advice identified.

International COVID-19 response: rapid review informs safety in dental practice

The worldwide impact of COVID-19 on dental services has been immense, reducing patient access and restricting care to extractions, in order to avoid aerosol generating procedures (AGPs) such as drill or ultrasonic-scaler. In order to reduce professional uncertainties around safe dental practice, and to mitigate against the risk of SARS-co-v2 transmission, Dundee designed and led a collaboration of researchers and guidance developers in a rapid review [R5].

With international support from the World Health Organisation, FDI World Dental Federation and Chief Dental Officers from Europe, America, Canada and New Zealand, a review of the 63 international guidelines for the reopening of dental services was conducted. The review highlighted considerable variation across countries and a lack of evidence for recommendations: for instance, preprocedural-mouthwash was recommended by 82% of national guidelines. However, the Cochrane review found no evidence for the use of preprocedural-mouthwash [R6].

UK national guidance of 60 minutes fallow time (leaving the surgery empty) following an AGP was in contrast to most guidelines and had resulted in severely restricted patient access. In response to the profession's concerns of a 60-minute fallow time, SDCEP established a UK-wide working group to rapidly review the evidence for AGP mitigation and published within 13 weeks. The review of contamination from AGP's suggested a potential risk of SARS-co-v2 transmission but no direct evidence to inform fallow time [R7].

3. References to the research

[R1] Elouafkaoui, P, Young, L, Newlands, R, Duncan, EM, Elders, A, **Clarkson**, JE, Ramsay, CR & Translation Research in a Dental Setting (TRiADS) Research Methodology Group (2016), An audit and feedback intervention for reducing antibiotic prescribing in general dental practice: the RAPiD Cluster Randomised Controlled Trial, *PLoS Medicine*, vol. 13, no. 8, e1002115, pp. 1-19. DOI: [10.1371/journal.pmed.1002115](https://doi.org/10.1371/journal.pmed.1002115)

[R2] Newlands, R, Duncan, EM, Prior, M, Elouafkaoui, P, Elders, A, Young, L, **Clarkson**, JJ & Ramsay, CR (2016), Barriers and facilitators of evidence-based management of patients with bacterial infections among general dental practitioners: a theory-informed interview study, *Implementation Science*, vol. 11, 11. DOI: [10.1186/s13012-016-0372-z](https://doi.org/10.1186/s13012-016-0372-z)

[R3] **Clarkson**, JE, Pitts, NB, Goulao, B, Boyers, D, Ramsay, CR, **Floate**, R, **Braid**, HJ, **Fee**, PA, **Ord**, FS, Worthington, HV, van der Pol, M, Young, L, **Freeman**, R, **Gouick**, J, Humphris,

GM, **Mitchell**, FE, McDonald, AM, Norrie, JDT, **Sim**, K, Douglas, G & **Ricketts**, D (2020), Risk-based, 6-monthly and 24-monthly dental check-ups for adults: the INTERVAL three-arm RCT, *Health Technology Assessment*, vol. 24, no. 60, pp. 1-138. DOI: [10.3310/hta24600](https://doi.org/10.3310/hta24600)

[R4] Ramsay, CR, **Clarkson**, JE, Duncan, A, **Lamont**, TJ, Heasman, PA, Boyers, D, Goulão, B, Bonetti, D, Bruce, R, Gouick, J, Heasman, L, Lovelock-Hempleman, LA, Macpherson, LE, McCracken, GI, McDonald, AM, McLaren-Neil, F, Mitchell, FE, Norrie, JDT, van der Pol, M, Sim, K, Steele, JG, Sharp, A, Watt, G, Worthington, HV & Young, L (2018), Improving the Quality of Dentistry (IQuaD): a cluster factorial randomised controlled trial comparing the effectiveness and cost-benefit of oral hygiene advice and/or periodontal instrumentation with routine care for the prevention and management of periodontal disease in dentate adults attending dental primary care, *Health Technology Assessment*, vol. 22, no. 38, pp. 1-143. DOI: [10.3310/hta22380](https://doi.org/10.3310/hta22380)

[R5] **Clarkson** J, Ramsay C, Richards D, Robertson C, & Aceves-Martins M; on behalf of the CoDER Working Group (2020). Aerosol Generating Procedures and their Mitigation in International Dental Guidance Documents - A Rapid Review https://oralhealth.cochrane.org/sites/oralhealth.cochrane.org/files/public/uploads/rapid_review_of_agps_in_international_dental_guidance_documents.pdf [Accessed 25 February 2021]

[R6] Burton, MJ, **Clarkson**, JE, Goulao, B, Glenny, AM, McBain, AJ, Schilder, AGM, Webster, KE & Worthington, HV (2020), Antimicrobial mouthwashes (gargling) and nasal sprays to protect healthcare workers when undertaking aerosol-generating procedures (AGPs) on patients without suspected or confirmed COVID-19 infection, *The Cochrane database of systematic reviews*, vol. 9, CD013628. DOI: [10.1002/14651858.CD013628.pub2](https://doi.org/10.1002/14651858.CD013628.pub2)

[R7] Innes, N, Johnson, IG, Al-Yaseen, W, Harris, R, Jones, R, KC, S, McGregor, S, **Robertson**, M, Wade, WG & Gallagher, JE (2021), A systematic review of droplet and aerosol generation in dentistry, *Journal of Dentistry*, vol. 105, 103556. DOI: [10.1016/j.jdent.2020.103556](https://doi.org/10.1016/j.jdent.2020.103556)

4. Details of the impact

Reducing Dental Antibiotic Prescribing

Prior to the RAPID trial, antibiotic prescribing in dentistry was increasing year-on-year, accounting for 10% of all antibiotics dispensed in the UK. It was estimated that 50% of dental antibiotic prescriptions were unnecessary, therefore negatively impacting on patient safety, effectiveness of treatment and contributing to the global threat of antimicrobial resistant (AMR) infections.

The RAPID A&F intervention (2013-14) was delivered to two-thirds (1,999) of dentists in Scotland and resulted in a 6% reduction in Scotland's national prescribing rates, equivalent to 20,000 antibiotic items over 12 months, demonstrating higher compliance with national guidelines avoiding overuse of antibiotics. Amongst the highest prescribers in the A&F intervention groups there was a 12% reduction. RAPID directly changed SDCEP 2016 Drug Prescribing Guidance and prompted two further national antibiotic prescribing audits by NES, completed by over 50% of all dentists **[E1]**. RAPID directly reversed dental antibiotic prescribing behaviour, stimulating and contributing to the 24% reduction in antibiotics prescribed since 2013; generating a benefit to the economy by saving Scotland's NHS circa £850k **[E2]**.

Evidence from RAPID has also led directly to additional national antibiotic stewardship strategies. The Scottish Antimicrobial Prescribing Group implemented a similar approach for General Medical Practitioners to reduce antibiotic prescribing, with plans to include dentists in future national quality improvement interventions **[E2]**. RAPID's process evaluation led directly to the introduction of national in-practice training to improve the quality and safety of dental antibiotic prescribing **[E1]**. As a result of this all of Scotland's dental practices are now required to undertake this training, which includes RAPID style A&F, at least once every three years as part of NHS practice inspection requirements. According to the Postgraduate Dental Dean of

NES: *The work of the Scottish Dental Clinical Effectiveness Programme has been pivotal in promoting a change in behaviour with subsequent reduction in antimicrobial prescribing.* [E1]

RAPiD has demonstrated that high quality research can be embedded in service delivery. Consequently, the impact of in-practice training is being evaluated in a national RCT to further inform national provision of education for the NHS (evaluation delayed by COVID-19, due to recommence in March 2021) [E1, E3]. RAPiD has been cited as an exemplar of research partnerships between practitioners and academia and has resulted in TRiADS being named an A&F laboratory that has had impact on research culture in healthcare systems by the International Audit and Feedback Metalab [E4].

National Priority - Enabling evidence-based policy

The IQuAD and INTERVAL trials have generated much needed evidence for policy makers about the clinical- and cost-effectiveness of risk-based recall and S&P. The Chief Dental Officer for Scotland notes the “*significant contribution in terms of evidence and guidance*” [E5] made by the Dundee team to the development of The Scottish Government’s 2018 Oral Health Improvement Plan, noting that:

the evidence they have generated from UK national trials in dental primary care has informed government thinking which underpins the design of our preventive approach.” [E5].

and commenting further on the value of the evidence in relation to informing models of preventive care that will form the basis of future oral health strategies:

The INTERVAL and IQuAD trials led by Dundee have provided my office with evidence to inform the design, development and cost effectiveness of the future preventive model of care [E5].

IQuAD has also been cited as the underpinning evidence for government policy in relation to changing the service provision and payment of S&P [E6], although dental policy development in the UK has been delayed due to the pandemic.

In a departure from normal process, the relevant Cochrane reviews were updated during the publication of IQuAD and INTERVAL [E7], minimising the delay between evidence generation, synthesis and adoption by practice. The findings were reported widely in the national and international news media and provided reassurance to the public that intervals between dental check-ups can be extended beyond six months without detriment to their oral health. This was particularly important given the impact of COVID-19 on the provision of dental care worldwide. Public Health England’s ‘Delivering Better Oral Health Toolkit’, to which all 26,000 NHS dentists in England and Wales are expected to comply, is being updated and has adopted the robust methods of SDCEP in order to improve quality. The INTERVAL and IQuAD findings in relation to risk-based recall and S&P were included through the related Cochrane reviews [E8].

COVID-19 informing safe practice and widening patient access

The Dundee-led partnership response to COVID-19 has resulted in evidence-based guidance and resources that have supported the re-opening and mobilisation of dental services internationally [E9], [E10]. The SDCEP resources were downloaded over 320,000 times in the three months from March 2020, and the rapid reviews of international dental guidelines were distributed by WHO Director for Oral Health to global stakeholders, including the worldwide network of CDOs.

The SDCEP AGP Mitigation Rapid Review conclusions i) not to recommend preprocedural mouthwash and ii) that fallow time could safely be reduced to a minimum of 10 minutes, informed the Chief Medical Officers independent committee on AGP’s and was supported by all 4 of the UK’s Chief Dental Officers. Within 4 weeks of publication (25-09-20) the UK Infection Prevention Control guidance, published by Public Health England, changed its recommendation

Impact case study (REF3)

to take account of the SDCEP AGP Review [E11]. The British Dental Association estimates that the reduction in fallow time, from 60 minutes to 10 minutes, could increase access to UK dental care from 20% to between 60-70% [E12]. According to Public Health England:

The programme of research undertaken at SDCEP and led by Professor Clarkson has had far reaching impact for both dental policy and service delivery both nationally and internationally. [E8]

5. Sources to corroborate the impact

[E1] Statement of corroboration from Postgraduate Dental Dean and Director of Dentistry, NHS Scotland

[E2] Health Protection Scotland. Scottish One Health Antimicrobial Use and Antimicrobial Resistance Report 2016. Health Protection Scotland, 2017 [Report]. Pages 7, 15-16. Available at: https://hpspubsrepo.blob.core.windows.net/hps-website/nss/2306/documents/1_SONAR-2016.pdf. Ref 15 & 30 [Accessed 25 February 2021]

[E3] ISRCTN16294743. Evaluating the effectiveness of behaviour change theory-based training for reducing antibiotic prescribing by NHS dentists working in NHS primary care dental practices. DOI: [10.1186/ISRCTN16294743](https://doi.org/10.1186/ISRCTN16294743) [Accessed 25 February 2021]

[E4] Grimshaw JM, Ivers N, Linklater S, *et al.* (2019). Reinvigorating stagnant science: implementation laboratories and a meta-laboratory to efficiently advance the science of audit and feedback. *BMJ Quality & Safety*; 28 (5) pp. 416-423. DOI: [10.1136/bmjqs-2018-008355](https://doi.org/10.1136/bmjqs-2018-008355)

[E5] Statement of corroboration from CDO Scotland

[E6] Scottish Government. Health and Social Care. Written Answers. S5W-19251. 29 October 2018. Available at: <https://www.parliament.scot/angiestest/ASTest2/WA20181029.pdf>. [Accessed 25 February 2021]

[E7] Lamont T, Worthington HV, Clarkson JE, Beirne PV. (2018) Routine scale and polish for periodontal health in adults. *Cochrane Database of Systematic Reviews*, Issue 12. Art. No.: CD004625. DOI: [10.1002/14651858.CD004625.pub5](https://doi.org/10.1002/14651858.CD004625.pub5)

[E8] Statement of corroboration from Public Health England.

[E9] Cochrane Oral Health. COVID-19 Case story. Available at: https://www.cochrane.org/sites/default/files/public/uploads/covid_case_story_-_cochrane_oral_health_final1.pdf [Accessed 25 March 2021]

[E10] Scottish Dental Clinical Effectiveness Programme (2020) Mitigation of Aerosol Generating Procedures in Dentistry. A Rapid Review. Available at: <https://www.sdcep.org.uk/wp-content/uploads/2021/01/SDCEP-Mitigation-of-AGPs-in-Dentistry-Rapid-Review-v1.1.pdf> [First Published 25 September 2020 (minor update 25 January 2021); Accessed 25 February 2021]

[E11] Public Health England. (2020) COVID-19: infection prevention and control dental appendix. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/954834/Infection_prevention_and_control_guidance_dental_appendix.pdf [Accessed 25 February 2021]

[E12] British Dental Association (2020) *SDCEP, fallow time and AGPs: What you need to know*. Available at: <https://bda.org/news-centre/blog/Pages/SDCEP-fallow-time-and-AGPS-What-you-need-to-know.aspx> [Accessed 25 February 2021]