Institution: University of Warwick
Unit of Assessment: UOA2 - Public Health, Health Services and Primary Care
Title of case study: Development and implementation of Digital Primary and Urgent Care systems within the NHS and internationally
Period when the underpinning research was undertaken: 1 August 2013- 31 December 2020
Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Professor Jeremy Dale	Professor	October 1997- present
Dr Helen Atherton	Associate Professor	November 2015- present
Dr Veronica Nanton	Senior research fellow	January 2005- present

Period when the claimed impact occurred: 1 August 2013- 31 December 2020
Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact (indicative maximum 100 words)

University of Warwick research has influenced digital approaches to care. The work has created important system change in services that have benefited patients and clinicians in a range of ways. Examples include:

- Warwick research informed the development of Odyssey, a clinical decision support tool for emergency, urgent and primary care; now used by UK, New Zealand and Australian ambulance services, resulting in efficiencies that are allowing substantial cost savings for health services.
- NHS England and The Royal College of General Practitioners guidance regarding online consultations have been shaped by Warwick research, and used by health care professionals to support delivery.
- The online resource 'Care Companion', co-created with carers, the NHS and social care empowers carers, relieving pressure on health and social care services in Coventry and Warwickshire.
- Online assessment systems, CHAT-P and CHAT-B enable remote follow up for cancer patients

2. Underpinning research (indicative maximum 500 words)

The NHS has been increasing its use of digital approaches to improve patient care. Such change has often been policy-led or industry-led. A multi-disciplinary team of researchers at Warwick's Unit of Academic Primary Care, led by Professor Jeremy Dale, are addressing the need for rigorous development of interventions and evidence of effectiveness and acceptability to patients and service providers. A broad range of methodologies have been deployed, ranging from systematic reviews to co-production of interventions, and in depth qualitative studies, service evaluations and randomised controlled trials.

Clinician decision making in triage

Enabling services to appropriately prioritise patients supports more effective use of resources and the workforce. Dale was the first to demonstrate the safety and effectiveness of telephone assessment and triage supported by computerised decision support software (Odyssey) as an alternative to emergency ambulance despatch [3.1]. Working with industry, Dale and colleagues informed development of Odyssey to broaden its application to patient self-assessment; in 2014, they evaluated patients' use of Odyssey prior to GP appointment, demonstrating its acceptability, effectiveness and potential to save an estimated 160 seconds per clinical consultation [3.2]. As Co-Investigator on the Department of Health-funded SAFER1 trial, Dale

demonstrated the effectiveness of Odyssey when used to support at-scene emergency assessment of patients who have fallen [3.3].

Online interventions
A second strand of research explored the use of online interventions for supporting patients and carers. Building on a series of studies of unmet needs in prostate cancer care initiated in 2000 and a multi-centre NIHR funded study on communication and coordination in advanced illness, Dr Veronica Nanton led the development and feasibility testing of an online Holistic and Specific Needs Assessment (HSNA) for men with prostate cancer, CHAT-P, which facilitates information sharing and coordination between patients, primary and secondary care teams [3.4].

Starting in 2016, Dale and Nanton led the co-development of an online intervention, 'Care Companion' [3.5] through extensive involvement with carers and other stakeholders. This system empowers carers of older people to cope more effectively with caring roles through the use of an interactive, personalised IT resource.

Digital access to general practice
Dr Helen Atherton specialises in digital routes of access to general practice, and alternatives to the face-to-face consultation. Since joining Warwick in 2015 she has led a programme of work on digital access to general practice appointments and consultations. Atherton was co-investigator on the largest national study of alternatives to a face-to-face consultation to date, and led the 2018 final report [3.6]. With NIHR funding, she is currently chief investigator on a study examining patients' experience of online appointment booking in general practice, a key focus for NHS England.

Atherton has also collaborated with industry to conduct an evaluation of askmygp focusing on patient experience of online consultation and providing an evidence base for improvements [3.7]. The findings from this research, and several other publications from Atherton, went into NHS England guidance for use of online consultations and the publication was the ninth most read paper in 2019 in the British Journal of General Practice.

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3. References to the research (indicative maximum of six references)
[3.1] J Dale, S Williams, T Foster, **J Higgins**, H Snooks, R Crouch, C Hartley-Sharpe, E Glucksman, S George (2004) Safety of telephone consultation for "non-serious" emergency ambulance service patients, BMJ Quality & Safety; 13:363–373. doi:10.1136/qshc.2003.008003
[3.2] Poote AE, French DP, **Dale J**, Powell J. (2014) A study of automated self-assessment in a primary care student health centre setting. J Telemed Telecare. 20(3):123-127. doi:10.1177/1357633X14529246
[3.3] Snooks HA, Carter B, **Dale J**, Foster T, Humphreys I, Logan PA, Lyons RA, Mason SM, Phillips CJ, Sanchez A, Wani M, Watkins A, Wells BE, Whitfield R, Russell IT (2014) Support and Assessment for Fall Emergency Referrals (SAFER 1): cluster randomised trial of computerised clinical decision support for paramedics, PLoS One, Volume 9 (Number 9). Article number e106436. doi:10.1371/journal.pone.0106436
[3.4] Clarke, A. L., Roscoe, J., Appleton, R., Parashar, D., Muthuswamy, R., **Khan, O., Dale, J., & Nanton, V.** (2020). Promoting integrated care in prostate cancer through online prostate cancer-specific holistic needs assessment: a feasibility study in primary care. Supportive care in cancer : official journal of the Multinational Association of Supportive Care in Cancer, 28(4), 1817–1827. https://doi.org/10.1007/s00520-019-04967-y
[3.5] Dale J, **Loew J**, **Nanton V**, Grason Smith G. (2018) Coproduction of a Theory-Based Digital Resource for Unpaid Carers (The Care Companion): Mixed-Methods Study. JMIR Aging 1(1):e1 DOI: 10.2196/aging.9025
[3.6] Atherton, H, Brant, H, Ziebland, S, Bikker, A, Campbell, J, Gibson, A, McKinstry, B, Porqueddu, T and Salisbury, C (2018) The potential of alternatives to face-to-face consultation in general practice, and the impact on different patient groups: a mixed-methods case study. Health Services and Delivery Research, 6 (20). doi:10.3310/hsdr06200

[3.7] Eccles, A. Hopper, M. Atherton, H., **Turk, A**. (2019) Patient use of an online triage platform: a mixed-methods retrospective exploration in UK primary care. British Journal of General Practice, 69 (682). e336-e344. doi:10.3399/bjgp19X702197

Key grants:
PI Dale J, The clinical, organisational and cost consequences of computer-assisted telephone advice to category C 999 ambulance service callers: a randomised controlled trial, NHS Primary and Secondary Care Interface National Research and Development Programme, 1999-2004, GBP 370,000
Co-I Dale J, Evaluation of the costs and benefits of computerised on-scene decision support for emergency ambulance personnel to assess and plan appropriate care for older people who have fallen (SAFER1): a randomised controlled trial, Department of Health Information and Communication Research Initiative, 2006-2011, GBP 574,637
PI Christopher Salisbury, Co-I Atherton H, The potential of alternatives to face to face consultation in general practice, and the impact on different patient groups, NIHR, 01/11/2014-31/01/2017, GBP440,840
PI Atherton H, Investigating patient use and experience of online booking in primary care NIHR, 01/07/19- 31/10/20, GBP150,023

4. Details of the impact (indicative maximum 750 words)
Warwick research is influencing NHS policy, commissioning and service delivery, and informs rigorous development of digital interventions.

Development and adoption of the Odyssey triage system
As Dale is part-time Director of the Clinical Knowledge Unit with Advanced Health and Care Ltd, Warwick research on initial triage, secondary triage and patients' self-assessment of acute health problems directly influenced the development and marketing of Odyssey triage system. The Managing Director of Advanced highlights evidence from Poote's PhD thesis on clinician time savings following patient's self-assessment of symptoms using Odyssey, together with a 25% reduction in numbers seeking an urgent same day appointment [5.1].The ESTEEM trial findings (co-investigator Dr Tim Holt based at Warwick at the time of the trial) leading to a Lancet (2014) publication that was used to inform development of Odyssey for managing same day GP appointment requests; and the SAFER1 trial findings [3.3] showing the benefits of using Odyssey to support paramedics undertake at scene assessment of patients who have fallen, *"research has strategic value to Advanced that supports our sales and marketing of Odyssey to ambulance services"* [5.1]. Warwick research [3.1] has been used to inform deployment of Odyssey by national helplines, and ambulance and urgent care (e.g. out of hours) services in the UK, Eire, Australia and New Zealand, and has been used by Advanced to inform its product development and sales strategies [5.1]. The research has also informed guidance more widely; for example, referenced by NICE (Emergency and acute medical care in over 16s: service delivery and organisation guideline; NG94, 2018).

Drawing on Dale's research of the effectiveness of Odyssey to support secondary triage in emergency ambulance services, Advanced has seen its market share grow substantially; *"we now have 100% [of ambulance services] in New Zealand, about 40% for Australia, and about 30% for England, with more services taking Odyssey each year"* [5.1]. East Midlands ambulance service (EMAS), for example, report savings of over GBP10,000,000 annually through using Odyssey to support secondary triage of 999 ambulance calls [5.1]. Re-directing 999 callers to non-emergency ambulance responses resulted in EMAS consistently achieving the highest Hear and Treat rate in the UK in England [5.2]. EMAS's service improvement manager states: "*Advanced's software has made a huge impact, enabling us to boost performance dramatically by increasing efficiency. Without it we would not be able to save the amount of lives we do because we would have vehicles tied up on nonemergency calls…. Systems like Odyssey provide us with all the support and information we need to be able to make decisions safely for our patients. Without them more patients would be unnecessarily taken to hospital, which is inconvenient for them and the wider NHS*" [5.2]. Ambulance services worldwide are achieving similar benefits with Odyssey [5.1]; for example, Ambulance Victoria (Australia) have deployed

Odyssey and is using it to assess 200,000 emergency calls per annum, and New Zealand's helpline for over 350,000 calls per annum [5.3].

Advanced and Sensely, a Californian app designer, drew on Warwick research to develop the AskNHS symptom checker, incorporating Odyssey clinical content [5.1]. This is being deployed to support patient self-care, with Sensely winning the West Midlands Academic Health Science Network Industry Collaboration Award in July 2017 for its successful introduction [5.4]. It is enabling improved access to general practice in the NHS; the virtual health assistant, used in a federation of 38 GP Surgeries serving over 300,000 people in Lewisham, was praised by One Health Lewisham CEO, commenting *"We see incredible value in technology to empower patients to self-assess…I'm confident the app's obvious benefits will eventually be accepted and adopted by everyone"* [5.5].

The rigour of Odyssey and the evidence base that supports its use has been recognised by NICE. The Medical Director at Advanced states that: *"There are no equivalent symptom triage solutions that have been through and achieved the [NICE] accreditation…… Gaining this accreditation is testament to the expertise and experience of an in-house clinical team at Advanced, led by Professor Jeremy Dale*" [5.6].

Online platform intervention to support carers – Care Companion
Nanton and Dale co-developed, with industry (Global Initiative, a software design company) and wider stakeholders from the statutory and voluntary sectors [3.4]. It has now been commissioned across Coventry and Warwickshire by the local authorities and NHS as part of the area's Carers Strategy [5.7]. Promoted across the range of health and social care and third sector organisations, it has over 500 registrations (April 2020). There has been interest in deploying Care Companion more widely, and in January 2020 Professor Dale presented Care Companion to the Minister of State for Care.

Adoption of digital GP consultations and best practice guidance to GPs
Warwick research has influenced the guidance provided to healthcare professionals planning delivery of digital consultations. Atherton directly influenced the content of national guidance produced by NHS England on the implementation of online consultation in general practice. In line with their objectives to move towards 'digital first' primary care, NHSE has produced evidence based guidance for general practice, drawing on Atherton's research and associated toolkits [3,5, 3.6]. Atherton is a member of the NHSE Primary Care Digital Transformation advisory group and the Using Online Consultations In Primary Care Implementation Toolkit guidance was launched nationally in January 2020 to support adoption of online consultations [5.8]. In March 2020, the Medical Director for Primary Care (NHS England) instructed GPs to reduce face-to-face appointments for patients displaying symptoms of Covid-19, directing them to the aforementioned toolkit.

Atherton authored guidance for primary care on how to use text-based consultation, written in conjunction with the Deputy Director and Clinical Lead for Digital First Primary Care at NHS England, which has formed part of the NHS 'Advice on how to establish a remote 'total triage' model in general practice using online consultations' published in September 2020 [5.9].

Atherton has worked with professional bodies ensuring research is embedded to impact their guidance and practice, and facilitate uptake. In 2018 The Royal College of General Practitioners devised a guide for patients and clinicians, [5.10] which drew on research conducted by the Warwick team [3.5]. The guide has been downloaded 1601 times. Warwick research informed the General Medical Council (GMC) guidance for doctors on remote consultations (2018) [5.11] which forms the gold standard for practice in relation to remote consultations in order for doctors to fulfil their GMC registration requirements. Warwick also informed the development of a regulatory framework for assessing online providers of primary care (2017) to ensure that patients receive a minimum standard of care from online providers operating outside of the NHS; this is now applied to providers yearly [5.12].

Implementation of cancer specific holistic needs assessment intervention
Nanton's research underpinned the development of the first online cancer specific holistic needs
assessment (csHNA), CHAT-P [3.4], in the UK. CHAT-P offered patients remote follow up with
their healthcare team to discuss any concerns, enabled through online monitoring and
assessment enables the safe implementation of the stratified care pathways for cancer currently
taking place across NHS Trusts. The prostate specific HNA has been endorsed by the Urology
Expert Advisory Group of The West Midlands Cancer Alliance who are actively promoting rollout
across the region as Urology Services move to this model of care.

Nanton's CHAT-P [3.4] has been commissioned by University Hospital Birmingham NHS
Foundation Trust (UHB), with further NHS trusts considering adoption and is receiving positive
feedback from both patients and hospital staff [5.13]. Developed in collaboration with Infoflex, a
major NHS IT supplier, the platform is promoted to its customer base of 200 NHS Trusts and
CCGs. Since Infoflex merged with global IT service provider CIVICA, the csHNA now forms part
of an offer with global reach. The platform is in further development, funded by Action on
Bladder Cancer, to expand to cover bladder and colorectal cancers. Implementation and
deployment of the prostate csHNA at UHB planned to take place during the spring of 2020 has
been delayed by the diversion of Trust resources due COVID-19.

5. Sources to corroborate the impact (indicative maximum of 10 references)
[5.1] Written statement from Advanced Computer Software Ltd
[5.2] Advanced Clinical Decision Support factsheet https://tinyurl.com/nzhz5543 and Ambulance
statistics (page 6 table A5) 2015 https://tinyurl.com/khzhvfr5
[5.3] New Zealand National Telehealth Service Annual Plan (2017/18):
https://tinyurl.com/fubsmf26
[5.4] Sensely in collaboration with the West Midlands CCGs wins prestigious healthcare
innovation award for the Ask NHS mobile app: https://tinyurl.com/jn6uwdzn
[5.5] One Health Lewisham adopts virtual health assistant to reduce burden on GPs: (Practice
Business) https://tinyurl.com/47ynbdbh
[5.6] Advanced recognised by NICE for standards in healthcare https://tinyurl.com/kcea777k
[5.7] Warwickshire Council press release: 'Website for carers launched in Warwickshire' (June
2018)
[5.8] NHS England Implementation Guidance. Online consultations. (2019)
https://tinyurl.com/589x5t57
[5.9] Advice on how to establish a remote 'total triage' model in general practice using online
consultations: https://tinyurl.com/puy6ys69
[5.10] "The content of these questions has been influenced by research that is being carried out
by academic teams based in Bristol, Warwick and London": Royal College of General
Practitioners. Online consultations in general practices: the questions to ask (2018) and states
http://www.rcgp.org.uk/policy/rcgp-policy-areas/online-consultations.aspx
[5.11] General Medical Council 'guidance for doctors on remote consultations' (2018):
https://tinyurl.com/wwbbdzxs
[5.12] Care Quality Commission. How CQC monitors, inspects and regulates providers of online
primary care (April 2019): https://tinyurl.com/p84tdymm
[5.13] CHAT-P https://tinyurl.com/56764z2h