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The Application of Operational Research Techniques to Service Improvement - Teledermatology

Research Summary

Social research

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1. The teledermatology demonstration project was one of the projects funded under the Welsh Government's Programme to Maximise the Use of Existing Data. The demonstration project ran between 2011 and 2013 and relates to the study of teledermatology patients attending clinics in Hywel Dda Local Health Board between 2010 and 2012.
2. Teledermatology is a sub-element of telemedicine, which involves using technology to support delivery of healthcare at a distance. It has two forms: supported by a specialist nurse, patients may see a consultant via videoconference at a local clinic instead of travelling to an outpatient appointment or consultants may diagnose dermatological conditions

remotely using digital images. The second approach is called "store and forward".

Aims

3. To demonstrate, by way of example, the contribution that Operational Research can make to the evidence base and to engage Welsh Government officials in service optimisation issues e.g. using computer modelling methods to simulate services to create "what-if" scenarios.
4. To support the work of the Rural Health Implementation Group (RHIG) which wanted to ensure the use of Telemedicine is maximised across rural Wales and beyond.
5. To identify improvements in services and efficiency savings that could be achieved by treating dermatology patients using teledermatology:
 - a. To determine whether "store and forward" clinics allow patients to be diagnosed and treated in a shorter time frame.

Dadarsuodi ar gyfer Polisi



Analysis for Policy



- b. To examine the extent to which a patient's travel distance and the associated time and cost can be reduced.
 - c. To determine what would happen if the consultant dermatologist could reduce the current time delay in the teledermatology system by looking at the electronic referrals more quickly.
- 8. Computer simulations were developed to represent the patient's treatment 'pathway' using teledermatology and the outpatient clinic approach. The simulations used data for 123 patients attending Aberaeron and Aberystwyth clinics, since the Borth Clinic was new and the processes still in their infancy. The simulation models were developed with input from a multi-disciplinary team - the clinicians directly involved with the study, academic researchers, and policy officials and analysts within the Welsh Government.

Methodology

- 6. The anonymised data used in this demonstration project was provided by the Telemedicine Manager for Hywel Dda Local Health Board and relates to 143 "store and forward" patients who attended clinics at Aberaeron, Aberystwyth and Borth between 7th April 2010 and 9th May 2012.
- 7. One objective of the teledermatology project was to estimate the reductions in travel distance and time that were achieved by the 143 patients attending "store and forward" clinics compared with attending an outpatient appointment at the hospital. A partial postcode was used to estimate patient travel distance to the teledermatology clinic and the relevant outpatient department. The patient travel analysis assumed that the patient used private transport and not public or patient transport.
- 9. A cost analysis was undertaken to compare teledermatology with the outpatient approach. The cost analysis was based on the staff costs and patient travel costs (including fuel, carbon emissions and non-fuel operating costs) for each approach plus the cost of the camera equipment used in the "store and forward" clinics.
- 10. The cost analysis considered the direct and indirect costs associated with travelling to each clinic. The value of a patient's travel time was estimated using figures from the Department for Transport. Since the patients' employment status was unknown, the project used figures that assumed patients were not employed. The cost

analysis did not include any cost associated with patient transport as information on the proportion of patients using it was not available.

Key Findings

11. The project demonstrated that significant added value can be gained by using data already collected as part of delivering a service to inform additional research. Lessons were learned about working with practitioners and about data availability and quality.
12. The study showed that there were potential benefits of using telemedicine, particularly for patients in rural communities.
13. The study showed that in each of the “store and forward” clinics, the patients had shorter journeys if they went to their local clinic rather than the hospital:
 - The 102 patients who attended Aberystwyth Clinic saved a combined distance of 7,500 miles and a combined journey time of 178 hours.
 - The 21 patients who travelled to Aberaeron Clinic saved a combined distance of 849 miles and a combined travel time of 22 hours.

- The 20 patients who attended Borth Clinic saved just over 1,400 miles and 32 hours of travel.
 - The drive time analysis of the 143 “store and forward” patients showed that on average, a patient saved 75 miles by attending a local “store and forward” clinic instead of an outpatient appointment.
14. The patient travel analysis showed that the 19 patients who had their appointment via a videoconference at Bronglais Hospital rather than attending an outpatient appointment at Glangwili Hospital reduced their combined travel distance by close to 1,400 miles.
 15. The simulation model results show that, using teledermatology, all 123 “store and forward” patients passed through the system in an average elapsed time of 92 days. Using the outpatient pathway, 98 patients had completed their journey through the system after 600 days with, for those 98 patients, an average elapsed time in the system of 208 days.
 16. The elapsed time patients spent in the outpatient simulation model was heavily dependent on the waiting times associated with the hospital appointment system, particularly for

routine patients. When the waiting time was reduced to 21 days, the number of patients who completed their journey through the outpatient system increased to numbers similar to those found using teledermatology.

17. In this study, the cost of staff time to the Health Board was higher in the teledermatology 'store and forward' service due to the involvement of a dermatology specialist nurse as well as a consultant dermatologist. The cost of camera equipment also reduced the apparent cost-effectiveness of teledermatology but the cost per patient will reduce over time. The outcome of the cost analysis was also heavily influenced by the valuation of the patient's travel time. When valued using the Department for Transport's non-working £4 an hour estimate, the outpatient approach appears more cost-effective; when valued at an employed person's £28 an hour, teledermatology is more cost-effective. In reality, the real value of a patient's travel time will lie between these two values. For working people in Hywel Dda LHB, teledermatology would provide a more cost-effective means of receiving treatment than the outpatient system.

18. Overall, the project has shown that teledermatology through 'store and forward' clinics can offer improvements compared with the outpatient model, particularly in rural areas as it offers patients:

- reduced travel time and distance and therefore cost. Reduced patient travel may have a benefit to the environment and thereby support the WG's Sustainable Development objectives;
- a shorter waiting time for an appointment; and
- a shorter elapsed time in the system.

19. Simulation modelling can provide a useful virtual representation of a system to allow the impacts of different service delivery options to be compared and can be used to answer "what-if" questions such as "what would happen to waiting times if telemedicine was used more widely?"

20. The simulation models were presented at the Rural Health Implementation Group meeting (2012); the feedback from the event suggested that the visual nature of the simulation models helped to engage the audience, which included clinicians and policymakers.

Next Steps

21. If additional resources became available, the simulation model could be improved to include more detailed data e.g. the exact dates of GP visits and electronic referrals. Further research could examine whether patients travelled from home or work and their means of transport.
22. Further discussions with consultant dermatologists have shown that there is potential for teledermatology clinics to benefit other dermatology patients across Wales. The techniques used in this study could be applied to other teledermatology clinics in other local health boards to demonstrate how services vary across Wales and to give a clearer picture of how the use of teledermatology could be maximized throughout Wales.
23. It should be noted that the uptake and success of any service expansion to include teledermatology depends on the level of investment (personnel, equipment) and how it is integrated with existing primary and secondary care services.
24. The challenges that emerged during the demonstration process and the benefits of using OR methods to inform service optimisation will be explored in more detail in a Lessons

Learned report, publication of which is to follow.

Views expressed in this report are those of the researchers and not necessarily those of the Welsh Government

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