

An economic evaluation of introducing a skills mix approach to CT head reporting in clinical practice



P. Lockwood

Allied Health Department, Canterbury Christ Church University, Medway Campus, Rowan Williams Building, 30 Pembroke Court, Chatham Maritime, ME4 4UF, UK

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ABSTRACT

Background: Computed Tomography (CT) head examinations are a common diagnostic examination in National Health Service (NHS) acute hospital trusts. Current NHS England and Royal College of Radiologist (RCR) reports estimate the year on year increase of examinations to be 10%, with the designated workforce of radiologists disproportionate to the increase in demand of imaging reporting.

Objective: To determine an economic evaluation of cost, risk and feasibility of introducing skills mix CT head reporting by radiographers.

Design: Applying a PICO framework study to evaluate the patient workflow demand from retrospective audit data of CT head examination attendance ($n = 7266$) at an acute NHS district general hospital (DGH) to model an example workflow demand over 12 months. Reviewing potential outcome risk data (diagnostic thresholds), and feasibility (workforce capacity) of both interventions. The economic evaluation calculated hourly unit costs for comparison estimation of consultant radiologists and reporting radiographers using Netten et al.'s Ready Reckoner. Report unit costs were calculated utilising the Gishen's Ready Reckoner to estimate the uninterrupted time of reporting a non-complex CT report using RCR, Centre for Workforce Intelligence (CfWI) and Department of Health (DoH) estimates for both interventions.

Conclusions: The economic evaluation of introducing a skills mix reporting service model to the benefit of service delivery with the NHS has shown a potential £299,359–£124,514 per annum cost saving using a generic acute DGH workload model. Research into recorded discrepancy/error audit data for potential detrimental risk to patient outcomes identified a paucity of evidence, and recommends further research is needed.

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Introduction

The National Health Service (NHS) England released the Five Year Forward View¹ in 2014 to consider possible future changes that could be implemented to improve the NHS. The recommendations are hoped to increase patient outcomes and satisfaction, and decrease service delays, with an emphasis on investment for local service changes. In radiology early models of skills mix working have emerged in service improvements projects but the Five Year Forward View¹ sees reshaping delivery of our services must include system efficiencies to reduce poor services, and backlogs.

E-mail address: paul.lockwood@canterbury.ac.uk.

The two key driving factors for change have been a flexible response to workforce shortages,^{2–8} and demand for imaging that outstrips capacity.^{9–11} With 22 million people attending accident and emergency departments every year (3500 more patients attending every day compared to five years ago¹), systemic change in practice to cope with demand is a necessity. The NHS Imaging and Radiodiagnostic activity 2013/14 report⁹ findings estimated the number of computed tomography (CT) examinations from April 2013 to March 2014 were 5.2 million, with a 10% growth of examinations from the previous year,⁹ an increase of 43.1% over five years,¹² and 160% increase over a 10 year period.⁹ The Centre for Workforce Intelligence (CfWI)¹⁰ expect the overall demand for imaging to increase driven by many factors including growing/aging populations, increase in cancer diagnosis and chronic illness, screening programmes, 24/7 working hours, and future imaging techniques introduced into clinical practice.

The fifth Royal College of Radiologists (RCR) Workforce Report 2012,³ recorded the number of united kingdom (UK) registered radiologists as 2997 (4.7 working time equivalent consultant radiologist per 100,000 population in the UK), with a current deficit of 283 unfilled posts in the UK and a predicted 17% retirement rate in the next 5 years.

The RCR¹³ recommend a formal report for diagnostic examinations within 2 days, but acknowledge through workforce shortages that this is not occurring,¹² causing delays in cancer and serious illness diagnosis, hospital stay and the subsequent increased registration of radiology departments to NHS risk registers.¹³ In October 2014 a RCR survey¹³ highlighted a month delay in results in the 25% of NHS trusts surveyed, this survey was repeated in February 2015 with 71% of surveyed trusts having delays of more than a month, with over 2883 unreported CT scans, estimated for all trusts to be up to 3,693.¹³

Current Health and Care Professions Council (HCPC)¹⁴ estimates there are 29,711 radiographers registered within the UK, which is an increase above the predicted radiographer workforce by the CFWI¹⁵ of 19,830. A study by Clarke et al.¹⁶ showed that two UK universities in 10 years had trained 114 radiographers to report CT heads, and it is known at least 9 UK universities have run CT head reporting courses for radiographers. The last survey by the Society and College of Radiographers (SCoR) of radiographic practice in 2012,¹⁷ recorded at least 17 UK hospitals had started using CT head reporting by radiographers. With the SCoR promoting the national CT head reporting special interest group (CTSIG) Scheme of work¹⁸ to report examinations from a wide scope of referral sources including accident and emergency, inpatient, outpatient and general practitioner requests.

Methodology

In order to define the perspective of the study, and the key drivers of cost effectiveness (capacity and demand, benefits and risks) a PICO framework was adopted. Comprising of P = the patients having CT head imaging; I = Intervention of radiographers reporting of CT head examinations; C = comparison to existing intervention of radiologists; O = outcome comparison of current and alternative service provision through costs, savings, and risk outcomes.

The study received university research ethical and governance approval to calculate a deterministic scenario based upon costs and risks of the current and new intervention of reporting against data from a retrospective audit of CT examination attendance at an acute NHS district general hospital (DGH) and national tariffs. Using a defined time horizon of 12 months (Table 1), identified the key resource demand for CT examinations (n = 19,578), and in particular CT head examinations (n = 7266).

Decision tree modelling illustrated the process mapping of the current intervention (Table 2), allowing evaluation of costs and outcomes from each intervention for internal validity. Applying the audit data allowed external validation of the model as an example of workflow demand in a generic DGH. A decision tree was chosen over conventional Markov models as data for chronic returning patients was not available to consider all feasible transitions of patient’s health states or cohorts of particular disease categorised patients.

Patient group

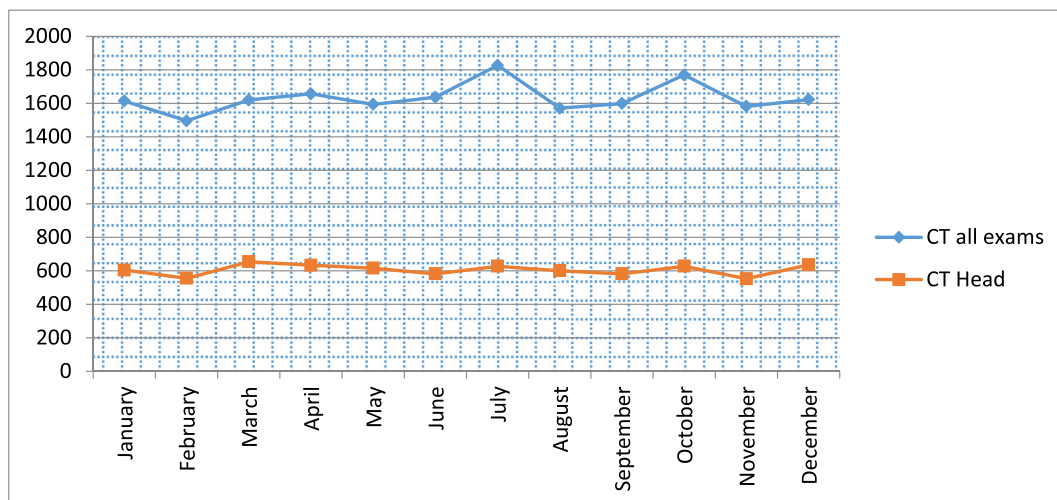
The retrospective data from the audit identified n = 7266 CT head examinations (Table 1) from a wide range of referral pathways including In and outpatients, accident and emergency, stroke wards, dementia clinics, and general practitioner sources.

The current intervention

The NHS at present utilises radiologists to report CT head examinations, but the drivers for change from this service include the low workforce numbers of UK registered radiologists.¹² To reach comparable radiologist levels with the rest of the European Union (EU) countries, the RCR estimated it would require an 82% increase of consultants.¹⁰

The CFWI report on Clinical Radiology¹⁰ commissioned by the Department of Health (DoH) with multiple stakeholders including the RCR and SCoR reviewed the RCR 2012¹¹ report for the Medical Programme Board and the Joint Working Group on Speciality Training Numbers. Recommendations included (but not implemented) an increase of 60 trainees per year due to the increasing demand of imaging, and the use of radiographers to effectively support the future expansion of radiology.

Table 1
Audit results of CT demand at an average sized generic DGH (2014–2015).



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