Quantifying the impact of increasing ultrasound workload on patient waiting times using multiple time series analysis: An NHS Trust experience

B. Olisemeke1,2, K. Hemming2 and A Girling2

Heart of England NHS Foundation Trust, Birmingham, UK1; School of Health and Population Sciences, University of Birmingham, UK2

# Background and Purpose

The demand for diagnostic imaging is increasing [[1](#_ENREF_1), [2](#_ENREF_2)]. There is yet an assessment of the quantitative impact of increasing demand on ultrasound waiting times, a key quality indicator. Our study attempts to fill that gap.

# Methods

Our study was performed using multiple time series analysis (MTSA). MTSA refers to a group of statistical models for describing the relationships between two or more time series. The choice of a particular models is a function of the statistical characteristics and relationship between the series [[3](#_ENREF_3), [4](#_ENREF_4)]. Structural vector auto-regression (SVAR) is indicated if the assumption of weak exogeneity between the series is violated[[3](#_ENREF_3)].

Weekly workload and waiting time data were retrieved from the radiology information system (RIS) of the Heart of England NHS Foundation Trust from June, 2008 to September, 2013. The data was log transformed and tested for stationarity using the Dickey Fuller augmented test as described in [Box, Jenkins and Reinsel [5](#_ENREF_5)]. SVAR model was specified in iterative manner [[3](#_ENREF_3)]. All analyses were done on STATA 13TM.

# Results

314,667 patient episodes were recorded within the study period. Five clinical specialties generated over 70% of the ultrasound workload: General Practice (37%), General Surgery (14%), General Medicine (9%), Gynaecology (8%) and Urology (6%). The mean weekly workload increased by 32% from 936 (SD 102) to 1240 (SD 135) over the study period. The impulse response function (IRF) computed from the SVAR model indicated that 1% increase in workload is associated with a subsequent increase of 0.07% (CI 0.043, 0.102) in median waiting time. A graphical presentation of the IRF is shown in fig 1



Fig. 1 Orthogonalized impulse (workload) response (median waiting times) function computed from SVAR model

# Conclusions

Five clinical specialties were responsible for generating over 70% of ultrasound workload. Targeted demand-management interventions within the Trust should pay attention to these specialties. Our results suggests that SVAR model can be reliably used to evaluate the quantitative impact of increased workload on ultrasound waiting times.

**References**

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