Impact of PACS in fracture clinic

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Introduction
Picture Archiving and Communications System (PACS) enables images, such as x-rays and scans, to be stored electronically and viewed on screens, so that healthcare professionals can access the information and compare it with previous images at the touch of a button. PACS forms an integral part of the government’s NHS connecting for health initiative. Some great claims have been made about its benefits from “reducing the amount of exposure to radiation for patients” to “delivering a better National Health Service (NHS)”.

A review of the current literature was performed to try and substantiate these claims. Conflicting literature suggests that PACS may lead to improved business efficiency and patient care while other refute the guarantee of productivity gain with PACS. The benefits of PACS include the ease in locating specific images, minimising the risk of film loss, the ability for post-processing manipulation of images and the simplicity in transferring images between different sites. Yet clinicians with experience of other NHS information technology systems would cite many potential disadvantages such as system crashes, the lack of users consultation prior to implementation of such system, the screen quality used to view the images and the cost of implementation.

The introduction of PACS at Selly Oak Hospital, Birmingham, in September 2007 provided the opportunity to observe the impact and the efficiency of PACS in the setting of a fracture clinic. Efficiency is defined as being effective without wasting time, effort or expense. In this study, efficiency is determined by measuring patient journey time pre- and post-introduction of PACS. The question was whether patient journey time could determine the efficiency of PACS. Fracture clinics are heavily dependent upon the use of imaging for diagnostic purposes. The use of PACS should eliminate the issue of lost films and should facilitate the clinicians in locating and comparing previous images without much difficulty. By measuring patient journey time pre- and post-introduction of PACS, where no other new variables are introduced to the normal practice of a fracture clinic, should give an indication of the impact of PACS. The efficiency could then be extrapolated from the collected data with the aim of the study to determine the efficiency of PACS by measuring patient journey time pre- and post-introduction of PACS in a fracture clinic.

Materials and methods
A prospective observational study took place at the fracture clinic of the Selly Oak Hospital. Two weeks of patient journey times were recorded pre-introduction of PACS, two and 18 weeks post-introduction of PACS. The patient journey time consists from the moment when the patients registered with the fracture clinic receptionist to the time they departed from the clinic. The data was collected by the author of the study. All data from the study were analysed by using Minitab statistical package.

Results
1,454 patients were seen in the fracture clinics in this six-week period. 453, 516 and 485 patients were seen in the pre-introduction, two and 18 weeks post-introduction of PACS respectively. Using analysis of covariance, the difference in the total number of patients seen in these three different periods had a p-value 0.493 (figure 1). The difference in the total patient journey time in these three periods had a p-value 0.821 (figure 2).

Discussion
Comparison of the total number of patients seen in these three different periods had a p-value 0.49, highlighting that these three separate time periods are similar in terms of numbers of patients attended fracture clinic with no significant difference. On analysis of the difference in total patient journey times in these three time periods had a p-value 0.821, indicating that there is no significant difference in patient journey time pre- and post-introduction of PACS. Thus, refuting the guarantee of productivity gain with

FIGURE 1
The difference in the total number of patients seen in these three periods (Post = two weeks post-introduction of PACS, Post Plus = 18 weeks post-introduction of PACS, Pre = pre-introduction of PACS).

FIGURE 2
The difference in total patient journey time in these three periods (1 = Pre-PACS introduction, 2 = 2 weeks post-PACS introduction, 3 = 18 weeks post-PACS introduction).
PACS in the fracture clinic as demonstrated by this study.

This study has limitations in terms of biases that are hard to control or eliminate in a day-to-day NHS setting without causing inconvenience to the dynamics of the hospital. A patient’s journey time may have easily increased as the patient had to wait for a long time within the radiology department or waiting to be seen by the surgeon, physiotherapist or by the plaster technician. These biases were subjected in all three time periods and, by collecting data over a two-week period, it would have hopefully given a true reflection of the practice of a fracture clinic and account for these biases.

The introduction of assessing patient journey time twice post-introduction of PACS was to minimise the possible bias of mastering the use of PACS. 18 weeks time period was deemed a sufficient length of time to have learned to use PACS efficiently and competently. Despite reassessing patient journey time at 18 weeks post-introduction of PACS, it did not show that PACS has improved the efficiency of the fracture clinic.

The above result suggests that the introduction of PACS does not increase the efficiency of fracture clinic. This has implications in terms of cost-effectiveness of implementing PACS in the clinical setting. Before embarking upon the financial debate of PACS, we should once again remind ourselves that efficiency takes into account of being effective without wasting time, effort or expense. There are other factors that are difficult to objectively measure in this study but, nevertheless, contribute to the efficiency of PACS in the fracture clinic setting. A study found that after the implementation of PACS, physicians more frequently viewed and interpreted radiology images themselves and viewed images less frequently with radiologists. This implies that physicians and radiologists have saved working time which could be used elsewhere with the introduction of PACS. Another factor that should be considered is the level of satisfaction with access to radiology images and reports. It has been shown that the physician satisfaction has increased significantly for radiology services after digital film implementation. They were also more satisfied with digital image availability than with hard copy film retrievability.

**Conclusion**

The data from the study suggests that PACS does not increase the efficiency of fracture clinic but there are other factors that are difficult to objectively measure but contribute positively to the efficiency of PACS. There is also the potential long-term financial gain with the implementation of PACS which was not explored as it was beyond the scope of this study. Overall, considering other contributing factors, the implementation of PACS has a constructive impact not only to the fracture clinic setting but across the entire health system.

**References**