

CT Scan Services In The Rural Setting, The Clinical Need And Cost Effectiveness: The Katherine Hospital Experience (Australia)

M Al-Shawi, T Watson, J Carlson, L Anthony, M Thomas

Citation

M Al-Shawi, T Watson, J Carlson, L Anthony, M Thomas. *CT Scan Services In The Rural Setting, The Clinical Need And Cost Effectiveness: The Katherine Hospital Experience (Australia)*. The Internet Journal of Surgery. 2013 Volume 30 Number 1.

Abstract

The Katherine District Hospital, positioned 300 kilometres south of Darwin, provides health coverage over an area of 340,000 square kilometres. A study done in 2009 and presented in 2010 at a national surgical conference provided publicity for the economic rationale and underlined the need for a CT scanner in Katherine. The private sector sensed an opportunity and purchased and installed a CT scanner in Katherine.

The methodology utilised and the results of the initial study are presented with a view to empower similar rural and remote centres in Australia to assess their needs in an appropriate fashion.

INTRODUCTION

Head injuries are a common cause for admission to hospital. Appropriate and early treatment is often critical for a good outcome. Early detection of intracranial hemorrhage requiring treatment is an important step involving computed tomography (CT) scanning. It is crucial and cost saving¹ to perform early CT scanning prior to clinical deterioration.² Head injury management recommendations for timing of CT scans vary from immediate to 8 hours post-injury.³⁻⁴ In rural settings, this presents significant challenges in terms of access to diagnostic and interventional services.⁵

The Katherine District Hospital is located in the Northern Territory, between Western Australia and Queensland, and its services cover an area of 340,000 km². It extends as far as Dunmarra to the south and Pine Creek to the north. A population of 19,000 is served by Katherine District Hospital, and there is also an annual tourist presence of more than 500,000 visitor-nights.⁶ The nearest CT scanner service used to be located 300 km away, at Royal Darwin Hospital and Darwin Private Hospital. This raised concerns for the timely use of CT scanning for patients with head injuries serviced by Katherine District Hospital. This study examined the number of patients transported from Katherine to Royal Darwin Hospital for access to CT scans following traumatic brain injuries and the effects on costs and clinical outcomes

for patient care.

METHODS

A retrospective study was conducted over a period of 2 months, from 1 July 2009 to 31 August 2009.

The first part of the study obtained an accurate estimate for the number of patients transferred from Katherine to Darwin for a CT scan. A retrospective list of patients who were transferred to Darwin was compiled by reviewing the Patient Assistance Travel Scheme (PATS) and this was compared to the CT scan database to determine which patients had a CT scan performed during the transfer. A helicopter transfer list was also retrieved and compared to the same CT scan database. This method of estimation did have limitations that probably resulted in an underestimation. Patients were not identified if they presented to Darwin by their own means, whether electively without the help of patient transfer or in an emergency where the patient or the family chose to drive to Darwin.

The second part of the study provided a retrospective review of all the patients admitted with head injury to Royal Darwin Hospital in the two-month period of the study. Patients who were transferred from Katherine District Hospital were then identified by examining the admission records from both Royal Darwin Hospital and Katherine District Hospital. The

time stamp on CT scan for each patient transferred from Katherine District Hospital was then recorded to determine the length of time between admission and obtaining the CT scan.

Total travel costs for patients transferring between Katherine and Darwin were obtained by recording expenses for transport by ambulance, fixed wing airplane, patient transport buses, and helicopter. These expenses were obtained through Katherine District Hospital's Patient Assistance Travel Scheme (PATS) office and included costs claimed by patients for making their own trips between the two hospitals, as the government provides reimbursement for these expenses. The total costs included only travel expenses, not the cost of CT scanning itself.

RESULTS

In the two-month period examined, there were 440 travel episodes between Katherine and Darwin. Of those travel episodes, 74 patients had a CT scan as part of their management at Royal Darwin Hospital. Seven of these patients were admitted due to a traumatic head injury requiring a CT scan at Royal Darwin Hospital.

The delay between accidents and the time of admission to Katherine District Hospital for these 7 head injury patients are shown in Figure 1. The average waiting time for admission was 3.57 hours, while the median was 3.6 hours. Figure 2 displays the wait times between accidents and the time CT scans were performed for those 7 patients. The average wait time was 27.7 hours, while the median was 18 hours. It should be noted that one patient's wait time (Mr. 4) was much longer than the other patients' were. However, all 7 patients waited past the recommended maximum 8-hour mark for a CT scan.

The total travel cost for transfers of the 74 patients identified in our study between Katherine and Darwin over the two-month study period was \$213,407, averaging \$2,883 for each patient. This can be extrapolated to a projected cost of 1.28 million dollars a year.

DISCUSSION

This study examined the economic and clinical implications of travelling from the Katherine region to Royal Darwin Hospital to obtain CT scanning. During the two-month period examined, a large cost was incurred for transport of

patients from Katherine to Darwin. This called into question the prudence of allocation of hospital resources.

The impact on the patients and their families also needs to be considered, as the travel time caused a delay in establishing diagnosis and providing definitive care. This was especially important in the cases of traumatic head injuries. All 7 patients with traumatic head injuries in this study waited past the longest recommended time of 8 hours for a CT scan, with the majority waiting many hours longer than this. The clinical outcomes of these long wait times could not be ascertained, but it is possible that further injury could have occurred in that time.

The results of this study indicated that Katherine District Hospital was in need of a CT scanner, as it would be clinically desirable and potentially cost-saving for the hospital and the patients.

These results were presented at the Provincial Surgeons of Australia (PSA) meeting in 2010 and won the President's Award, which spurred media coverage of the issue and, as a result, attracted the private sector. A private CT provider quoted an approximate figure of \$350,000 for a second-hand scanner including one year of maintenance and \$300,000 for the facility expansion. However, this quote for the expansion reflected considerable in-house effort for installation.

A CT scan service was established in Katherine in February 2012 backed by a remote-reporting service. However, the CT scanner is currently located in a local radiology and ultrasound facility in town rather than attached to the hospital itself.

Our study established the clinical need for the CT scanner in this rural setting as well as its cost effectiveness. The presence of an operational private CT service that is economically self-sustainable is proof of our findings, taking into consideration the fact that the private CT scanner in our study relies completely on the income generated from providing the services and does not benefit directly from the savings in travel costs from the patients having the scans locally. This has provided a partial solution to the problem, as the scope of the service is limited to patients requiring elective or semi-urgent scans and only a limited number of emergency cases due to its location outside the hospital, and limits the utilisation of the scanner for urgent and critical patients, resulting in diminished patient volume.

We feel that the previous lack of a CT scanning service in

Katherine is not unique, as the same scenario may present itself throughout regional and rural Australia, and we hope that our project may shed some light on an important challenge in rural health and a possible solution. However, we would recommend that the CT be imbedded within the hospital to be more accessible and fully utilized.

CONCLUSION

Our project introduced a method for the determination of the economic feasibility and clinical benefits of establishing a medical CT scanner service in a regional hospital using readily available, reliable data. For other regional locations with similar equipment shortages, it is felt that this method can be used to assess the viability of introducing similar

medical services imbedded within the hospital for the betterment of patients and the health service.

References

1. Ingebrigtsen T, Romner B: Routine early CT-scan is cost saving after minor head injury. *Acta Neurol Scand*; 1996; 93: 207-10. DOI: 10.1111/j.1600-0404.1996.tb00201
2. ITIM NSW Head Injury Guidelines. SHPN: (SSD) 110189, ISBN: 978-1-74187-587-4
3. NICE clinical guideline 56: Head injury: triage, assessment, investigation and early management of
4. Traumatic brain injury: Diagnosis, Acute Management and Rehabilitation ISBN:978-0-47-27973
5. Treacy PJ, Reilly P, Brophy B: Emergency neurosurgery by general surgeons at a remote major hospital. *ANZ J Surg*; 2005; 75: 852-857. doi: 10.1111/j.1445-2197.2005.03549.x
6. http://www.health.nt.gov.au/Hospitals/Katherine_Hospital/index.aspx

Author Information

Modher Al-Shawi, Dr

Surgical Department, Austin Hospital
Heidelberg VIC 3084, Australia

Tony Watson, Dr

Surgical Department, Austin Hospital
Heidelberg VIC 3084, Australia

Joana Carlson, Dr

Surgical Department, Austin Hospital
Heidelberg VIC 3084, Australia

Luke Anthony, Dr

Surgical Department, Austin Hospital
Heidelberg VIC 3084, Australia

Mahiban Thomas, Dr

Surgical Department, Austin Hospital
Heidelberg VIC 3084, Australia