



## Role of Imaging in Hospital Transfers from Rural Hospitals

- One fourth of the US population lives in rural areas, but only 10% of physicians practice in these areas.
- Critical Access Hospitals (CAHs) provide primary services for many rural patients and often focus on stabilizing acutely ill patients before transferring them to tertiary care facilities.
- CAHs generally offer limited imaging services.
- Lack of imaging access or the absence of a radiologist is associated with almost 25% of transfers from rural hospitals.
- Imaging network integration between rural hospitals and higher care centers could be a cost-effective way to reduce unnecessary transfers.

Although one quarter of the American population lives in rural areas, only about 10% of physicians practice in these areas. Congress has recognized the need to improve access to medical services in rural areas by establishing Critical Access Hospitals (CAHs), which are defined as hospitals that have 25 or fewer acute care beds and are at least 35 miles from another hospital by primary roads (or 15 miles by rural roads). CAHs are generally limited in their ability to provide radiology services, partly because they do not offer all imaging modalities but also because they may not have the capacity to offer radiology services 24 hours a day.

A recent study indicates that almost 25% of transfers from rural hospital emergency departments to tertiary care centers can be attributed to lack of radiology services. Of these, 71% were transferred because no radiologist was available to interpret an imaging examination while 25% were transferred because the hospital lacked certain imaging services. After these transfers, over half the patients were discharged without being admitted.

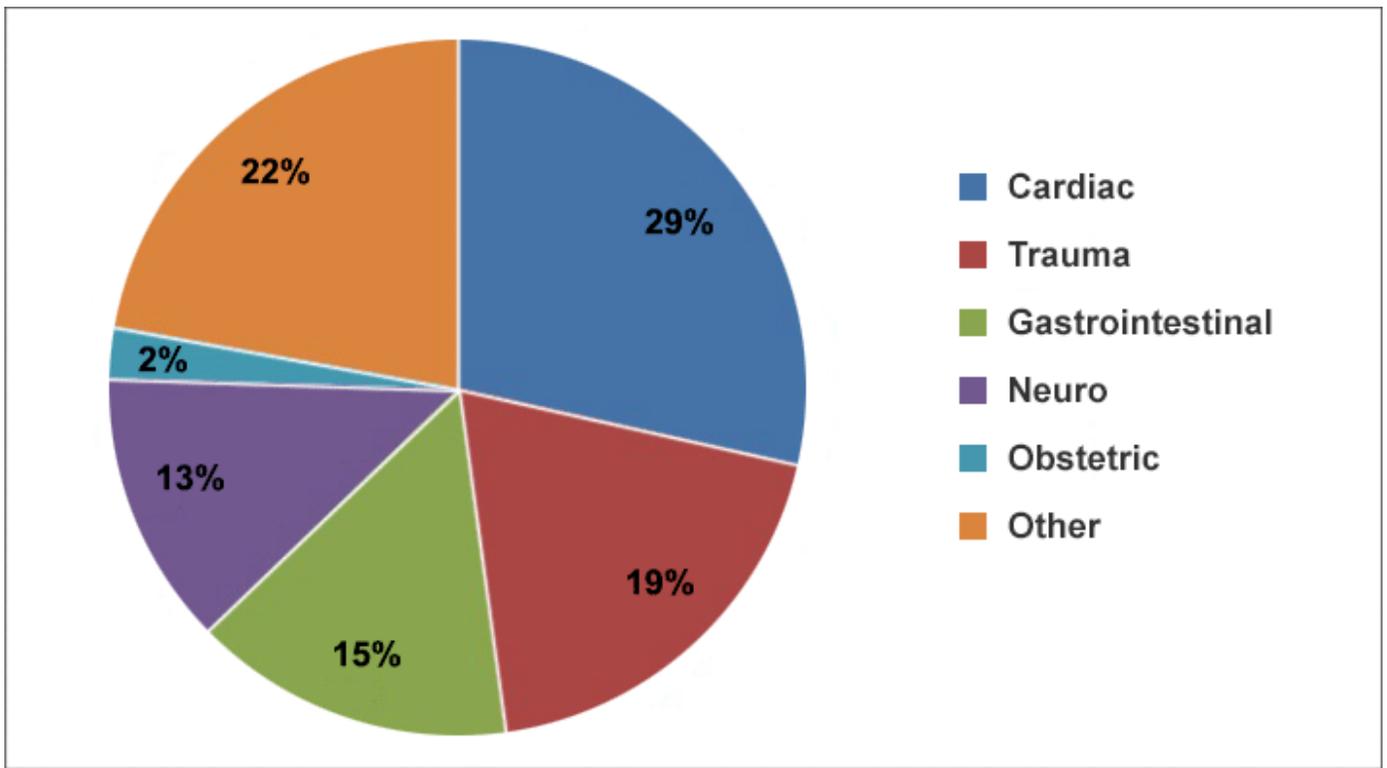
Transfers from rural hospitals to a tertiary care center are costly, especially if MedEvac flight services are used. These costs are not always covered by insurance and can impose a substantial burden on patients. In addition, helicopter flights (Figure 1) add an extra risk to patients and may not be possible in adverse weather conditions.

### Imaging Network Integration

Linking a rural hospital to a tertiary care center by sharing picture archiving and communication systems (PACS) and radiology services has the potential to reduce costs by decreasing the number of emergency transfers. In Massachusetts, the islands of Martha's Vineyard and Nantucket both have designated CAHs and integrated radiology services with Partners HealthCare. If an emergency transfer is required from these hospitals, the only option is helicopter transport to a tertiary care center; boats offer an alternate mode of transport for less urgent cases.



**Figure 1.** A medical transport helicopter waiting to transfer a patient from a CAH.



**Figure 2.** Breakdown of the clinical indications for transfer from a CAH to Mass General during 2012–2013.

A recent study has examined the role of imaging in the number of transfers from one of these hospitals to Massachusetts General Hospital in Boston. During the study period, the CAH received a little over 22,000 visits to the emergency room. Of these patients, 696 (3.2%) were transferred to an off-island hospital; 424 came to Mass General. The largest number (121; 29%) was transferred for cardiac care, followed by trauma (82; 19.3%), gastrointestinal ailments (63; 15%) and neurological conditions (54; 12.7%) (Figure 2). Air transport accounted for 78% of the transfers.

### Value of Integrated Imaging Services for CAH patients

The availability of integrating imaging services benefits CAH patients by both providing more timely care to those who are transferred as well as avoiding unnecessary transfers.

Eighty percent of the patients transferred to Mass General had received imaging services at the CAH (most commonly radiography and/or CT). Specialty-trained radiologists could view the images on the shared PACS, were available to interpret them 24 hours a day, 7 days a week and, in most cases, the CAH clinical team discussed the clinical findings with the off-site interpreting radiologist. If the clinical team decided to transfer a patient, the integrated PACS between the CAH and Partners HealthCare facilitated clinical care and treatment decisions before the patient arrived at MassGeneral. This integration is preferable to the alternate situation, in which patients arrive with or without images on CD and the clinical team can start reviewing the images and care only after the patients arrive. CDs can easily be misplaced and may be incompatible with the receiving facility’s system. In these cases, repeat imaging may be necessary, which further delays patient care. Although cardiac indications were the most common reason for patient transfer to Mass General, only 7% of these patients had imaging findings related to their diagnoses prior to their transfer. It is likely that providing more advanced imaging facilities at the CAH, such as cardiac CT, could reduce the number of transfers. Three large multicenter studies have now shown that coronary CT angiography (CTA) allows safe and efficient emergency room discharge of patients with low- to intermediate-risk chest pain. However, coronary CTA requires costly state-of-the-art scanners and the expertise to perform these examinations. Until a cost analysis is completed, it is not known whether it makes sense to implement such services at a CAH.

Coronary CTA services would be analogous to telestroke programs, which have been in place for more than a decade at the island hospitals. In these programs, emergency department physicians work closely with neurologists and radiologists from Mass General via video link to rapidly evaluate and initiate treatment for stroke patients.

## Further Information

For further information on the role of imaging in hospital transfers, please contact [Anand M. Prabhakar, MD, MBA](#), Cardiovascular Imaging, Department of Radiology, Massachusetts General Hospital and Associate Medical Director, Nantucket Cottage Hospital, at 617-726-8314.

We would like to thank Anand M. Prabhakar, MD, MBA, Brian Ghoshhajra, MD, Department of Radiology and Ali S. Raja, MD, MBA, MPH, Vice Chairman, Emergency Medicine, Massachusetts General Hospital, for their advice and assistance in preparing this article.

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