

Diagnostic Imaging Utilization in the Emergency Department: Recent Trends in Volume and wRVUs

Neo Poyiadji MD, Norman Beauchamp, Daniel Myers MD, Brent Griffith MD
Department of Radiology, Henry Ford Hospital, Detroit, MI.

Purpose:

Diagnostic imaging plays a critical role in the management of patients in the emergency department. As emergency departments continue to see a rise in patient visits there has been a historically disproportionate increase in diagnostic imaging volumes according to prior studies. Although imaging can improve treatment and patient outcomes, higher imaging volumes, particularly advanced imaging, leads to increased health care costs, patient radiation exposure and work demands on already taxed radiology departments. This study quantifies and characterizes the recent trends in emergency department imaging volumes and work RVUs at level 1 and level 3 trauma centers.

Materials and Methods:

Total annual diagnostic radiology imaging volumes and work RVUs (wRVU) were obtained from a tertiary level 1 (HFH) and a level 3 trauma (HFWB) center from January 2014 to December 2021. Imaging volumes were analyzed by modality type, exam code and location. Total annual patient emergency department encounters (EDE) were obtained to control for yearly and interhospital variations in ED patient census. Data was analyzed utilizing annual imaging volume or wRVU per EDE and percent change was calculated. The total annual number of Emergency Severity Index (ESI) levels 1-5 were obtained over the study period at each imaging site. The annual weighted average of the ESI level for each imaging site was calculated to control for patient complexity over time. The total number of observation, inpatient, and intensive care admissions from the emergency department were also obtained. The percent of admissions relative to total EDE for that year was obtained to assess for differences over time.

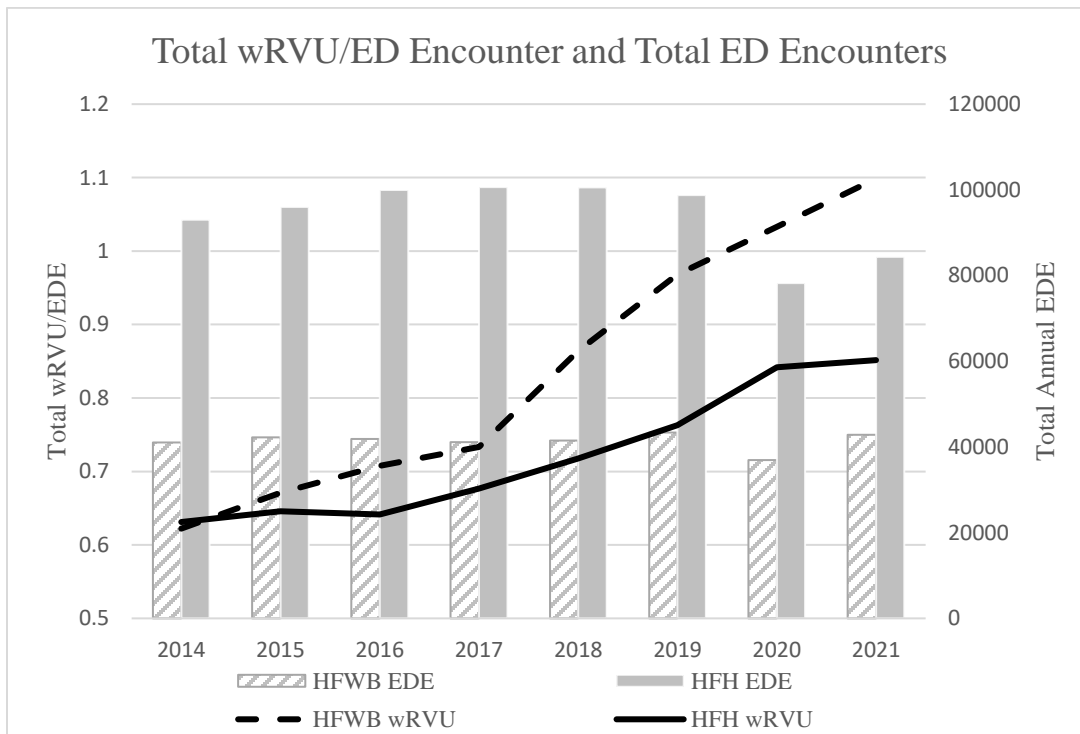
Results:

At the level one trauma center, imaging utilization volumes per EDE increased for CR, CT and MRI (5.5%, 35.5% and 56.3% respectively) and decreased for US (-5.9%) from 2014 to 2021. Imaging utilization volumes per EDE for the level 3 trauma center increased for US, CT and MRI (10.4%, 74.6% and 2.0% respectively), and decreased for CR (-4.4%) over the same 8 year period. Total wRVUs per EDE at the level 1 and level 3 trauma centers increased by 34.9% and 76.6% respectively over the study period. CT accounts for the majority of wRVUs at both sites in 2014 and 2021 (HFH: 62.3%, 71.0%; HFWB: 64.1%, 80.1% respectively). The increase in CT volume accounts for most of the increase in wRVU at both sites by magnitude, and CT wRVU per EDE increased by 53.7% at HFH and increased by 120.5% at HFWB over the study period. CTA head and neck studies demonstrated the greatest percent increase per EDE over the study period with an increase of 536.4% and 1,669.1% at HFH and HFWB respectively.

The average weighted ESI (wESI) declined over the study period at both imaging sites. The wESI for the level 1 center was 2.36 in 2021 and 2.66 in 2014. The wESI for the level 3 center was 2.79 in 2021 and 3.05 in 2014. The annual percent of observation, inpatient, and intensive care unit admissions of total EDE at HFH in 2021 was 6.7%, 17.9% and 3.1% respectively (5.9%, 16.5% and 3.4% in 2014). The annual percent of observation, inpatient, and intensive care unit admissions of total EDE at HFWB in 2021 was 9.6%, 18.6% and 2.2% respectively (8.1%, 18.7% and 4.0% in 2014).

Conclusion:

Emergency department imaging utilization increased over the 8-year study period at both level 1 and level 3 trauma centers with an increase in total work RVU per EDE. There is a disproportionate increased utilization of advanced imaging such as CT and MRI at the level 1 trauma center and increased CT utilization at the level 3 trauma center over time. Increased imaging utilization is independent of ED patient volumes, admission rates and disproportionately greater than the decline in average weighted ESI suggesting that there are extrinsic factors driving the increase in imaging utilization. Emergency department utilization trends suggests that there will be a continued increase in demand for advanced imaging interpretation, including at lower acuity hospitals, thus radiology departments should prepare for this increased work demand.



Modality	HFHB (%)*	HFH (%)*
Radiographs	-11.7 (9.8)	2.0 (13.5)
Ultrasound	9.3 (5.9)	-18.5 (8.7)
CT	120.5 (80.1)	53.7 (71.0)
MR	10.2 (4.2)	69.4 (6.8)
Total	76.6	34.9

* Parenthesis denotes percentage of all wRVU performed at that imaging site in 2021.

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