Impact of Obesity on Emergency Department Imaging Utilization and Selection

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BACKGROUND & AIMS

- Obesity is highly prevalent in the United States (U.S.) and reduces the quality of imaging studies due to poorer tissue penetration and increased attenuation of energy [1].
- We sought to better understand how obesity impacts imaging utilization and selection in U.S. emergency departments (ED).

METHODS

- We utilized the National Hospital Ambulatory Medical Care Survey (NHAMCS), a dataset of U.S. ED visits.
- A variable indicating patient obesity, representing body mass index (BMI) ≥ 30, was used as our exposure variable.
- Outcome variables included:
  1) Total number of different imaging modalities received
  2) Use of specific imaging modalities, including X-Ray, computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound
  3) Use of contrast
- Covariates included demographics, insurance status, and hospital characteristics.
- Logistic and linear regression models were constructed to assess independent associations between obesity and imaging utilization and selection.

Table 1: Imaging characteristics stratified by obesity with bivariate analysis investigating baseline (non-adjusted) differences between nonobese and obese patients.

	Not Obese (N = 45,221)	Obese (N = 3,673)	P-value
Total Number of Imaging Modalities Received, mean (SD)	0.75 (0.87)	0.89 (0.88)	< 0.001*
Imaging Received, n (%)			
Any Imaging	24,484 (54.1%)	2,324 (63.3%)	< 0.001*
X-Ray	16,854 (37.3%)	1,671 (45.5%)	< 0.001*
CT Scan	10,573 (23.4%)	990 (27.0%)	< 0.001*
without contrast	5,825 (55.1%)	499 (50.4%)	
with contrast	3,543 (33.5%)	394 (39.8%)	< 0.001*
unknown	1,205 (11.4%)	97 (9.8%)	
MRI	531 (1.2%)	61 (1.7%)	0.01*
without contrast	309 (58.2%)	36 (59.0%)	
with contrast	90 (16.9%)	10 (16.4%)	1.00
unknown	132 (24.9%)	15 (24.6%)	
Ultrasound	2,517 (5.6%)	283 (7.7%)	< 0.001*
Other Imaging	630 (1.4%)	77 (2.1%)	< 0.001*

* P < 0.05
P-values calculated using chi-square or t-test, as appropriate

Table 2: Multivariable regression models analyzing the association of obesity with imaging selection, total utilization, and contrast use.

	Obesity
Total Number of Modalities†	1.14* (1.11–1.17)
X-Ray‡	1.41* (1.31–1.51)
CT‡	1.19* (1.10–1.29)
MRI‡	1.39* (1.05–1.80)
Ultrasound‡	1.34* (1.18–1.52)
Contrast in Either CT or MRI‡	1.26* (1.10–1.45)
CT with Contrast‡	1.26* (1.09–1.45)
MRI with Contrast‡	1.06 (0.55–2.07)

† Values represent β and 95% confidence interval
‡ Values represent odds ratio and 95% confidence interval
* P < 0.05
Each regression analysis controlled for covariates, including age, sex, race/ethnicity, payment source, hospital region, and metropolitan statistical area status.

RESULTS

- **Obese patients received a greater number of total imaging modalities at a given ED visit than nonobese patients.**
- **Obesity was associated with an increased likelihood of receiving an X-ray, CT scan, MRI scan, and ultrasound.**
- **Obese patients were more likely than nonobese patients to receive contrast during CT studies. However, these was no significant difference between obese and nonobese patients regarding contrast use with MRI studies.**

CONCLUSIONS

- Obesity was associated with increased overall imaging utilization for all modalities.
- Limitations include a cross-sectional design, inability to control for specific diagnoses and comorbidities, and a lack of a numerical BMI variable.
- Results could indicate a higher disease burden among obese patients, or may suggest a higher reliance on diagnostic imaging in this population owing to factors such as difficulty with physical examination.
- Further research is required to determine clinical significance of results and establish causality.

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REFERENCES

[1] Rajapakse et al. *Academic Radiology.* 2014; 21(1), 1-2