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TITLE

Radiology Reporting of Obesity - A Survey of Patient and Clinician Attitudes.

INTRODUCTION

The prevalence of obesity and the performance of medical imaging studies are both rising world-wide. Radiology studies performed for other reasons can be used to diagnose and quantify obesity, and correlate with obesity-related surrogate markers (such as serum glucose, triglycerides, LDL cholesterol and inflammatory markers) and endpoints such as all-cause mortality.(1, 2) Diagnosing obesity on imaging for other reasons fulfils many of the criteria of a screening test.(3)

Unlike other risk factors such as osteopenia, coronary artery calcification and carotid stenosis, there exists a lack of clear reporting guidelines, and a lack of consensus amongst clinicians and radiologists. While obesity is both a strong risk factor and disease state, it possesses a unique social stigma.(4) The sensitivity of patients, radiologists and referring clinicians to the language of obesity overshadows any reporting or discussion, although little research has been conducted in this area. A survey was performed to explore patient and clinician attitudes towards the radiology reporting of obesity, to assess how such information should be presented, and to investigate other factors which may influence preferences for such information.

MATERALS AND METHODS

Two separate six-question surveys were designed, one aimed at patients and one aimed at clinicians. The content of both surveys were similar across each question, with the wording and language adapted for both patients (simplified English with use of first-person where appropriate), and clinicians (medical English with reference to third-person patients where appropriate). Both surveys consisted of five rating-scale questions (7-point range) assessing the strength of preference for a range of issues. Possible responses were strongly disagree (1); disagree (2); somewhat disagree (3);

undecided (4); somewhat agree (5); agree (6); strongly agree (7). A further Likert scale question was included, assessing clinical and patient preference for how obesity should be quantified on radiology reports. Question format and phrasing was performed by both radiologists and non-medical specialist researcher with survey research experience. The institutional ethics committee approved both the study protocol and the survey documents, all of which were collected anonymously with the anonymous right to refuse consent explained to all participants.

A hard-copy survey of the was administered to all hospital clinicians (the largest group of referrers to radiology) at both medical grand rounds and surgical grand rounds in the same month at a large university teaching hospital (*supplementary material 1*). This sample size was chosen as it offered the largest cross-section of clinicians in the least possible sittings without personnel overlap. There were no exclusion criteria from the clinician survey.

The patient survey along with an explanatory cover letter was administered to all outpatients attending the general radiology department between 9 am and 5 pm on a single day (*supplementarity material 2*). A single day was chosen to ensure no repeat sampling. Inpatients were excluded for two reasons; firstly as they do not register prior to scanning in our institution and are thus difficult to capture in the institution involved, and secondly as there are issues of autonomy and capacity within the inpatient population. Outpatients who were unable to read the explanatory cover letter due to infirmity, language or communication difficulty were excluded. Children were excluded. Where requested by outpatients, additional help from the principal investigator was provided to clarify patient questions. The results were tabulated and analysis performed on Numbers (MacOS) within which quantitive analysis performed and analysis of means was performed. Survey reporting was performed in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional observational studies, with study checklist completed (*supplementarity material 3*).(5)

RESULTS

58 completed clinician surveys were returned representing a variety of grades of doctors, and several nurse practitioners (Table 1). 58 completed patient surveys were performed. In five returned surveys there were individual items omitted (the remaining completed items were included for analysis), all other surveys were completed in full.

Table 1.

Should overweight / obesity should be described?

Where overweight/obesity was present on medical imaging performed for any reasons, clinicians and patients strongly agreed that it should be included in the radiology report (clinician response mean of 5.9 of a 7-point scale, standard deviation of 1.1, and patient response M= 5.8, SD 1.7) (Fig 1a-b).

Figure 1a.

Figure 1b.

Preferred format of obesity / overweight information

72.4% of clinicians and 64.3% of patients indicated a preference for a quantitative report, describing the level of adiposity in relation to a reference range. 13.8% of clinicians and 25% of patients would prefer a qualitative report, simply indicating the presence or absence of obesity. The remaining 13.8% of clinicians and 10.7% of patients expressing no preference.

Perceived insult

Clinicians somewhat disagreed and patients disagreed that a radiology report describing overweight / obesity would be considered insulting (M=3.0, SD = 1.5 and M=2.1, SD = 1.8 respectively) (Fig 2a-b).

Figure 2a.

Figure 2b.

Risk of scan avoidance if obesity was reported

Clinicians strongly disagreed that they would avoid sending patients for scans if the radiology report included overweight / obesity (M=1.3, SD = 0.6) (Fig 3a). Patients also disagreed that including such information on a report would result in scan-avoidance (M=1.9, SD=1.7) (Fig 3b).

Figure 3a.

Figure 3b.

Obesity-reporting as a prompt for clinical-patient engagement with overweight/obesity.

Clinicians agreed and patients strongly agreed that they would be more likely to discuss overweight/obesity if it was described in a radiology report (M=5.3, SD 1.6 and M=6.1, SD=1.6 respectively) (Fig 4a-b).

Figure 4a.

Figure 4b.

Would such information affect decision-making?

Clinicians somewhat agreed that a radiology report describing obesity would influence patient management decisions (M=4.5, SD = 1.6), while patients agreed that a report describing overweight/obesity would influence personal health and wellbeing decisions (M=6.2, SD 1.5) (Fig 5a-b).

Figure 5a.

Figure 5b.

A summary of response means and standard deviations is tabulated for both clinicians and patients respectively (Table 2, Table 3).

Table 2.

Table 3.

DISCUSSION

This single-institution exploratory survey of clinician and patient attitudes demonstrates a strong preference amongst both groups for the reporting of overweight/obesity on scans performed for other reasons. A quantitive report, describing the levels of adiposity in relation to a reference range, is preferred by both patients and clinicians. Clinicians stated this information on patient adiposity would somewhat affect clinical management. Both clinicians and patients reported they would be somewhat more likely to discuss overweight/obesity if armed with such a radiology report. Clinicians strongly disagreed that describing adiposity in radiology reports would reduce radiology referrals. Similarly patients stated that any such a description of adiposity is unlikely to cause them to avoid going for a scan in the future. Clinicians somewhat disagreed that describing adiposity in radiology reports would be considered insulting by patients. Patients correlated this, stating that they would not find such a description insulting. The results suggest both patients and clinicians want information on overweight/obesity to be included on radiology reports of scans done for any reason. The preference is for quantitive results, and both groups feel such information would be useful in medical management and in allowing an informed discussion on patient weight. Both clinicians and patients felt that such information was not likely to cause insult.

Healthcare provider weight-loss counselling increases weight-loss (OR=3.85).(6) Where healthcare providers do offer such weight-loss advice, it is associated with an increase in patient desire to loose

weight (OR=3.71), and patient attempts at weight loss (OR=3.53). However only 17% of overweight and 42% of obese patients ever recall receiving weight-related advice from healthcare providers however.(7) There is a growing expectation amongst patients of access to their own radiology reports.(8) Radiology reporting of obesity can thus serve as a prompt to both patients and clinicians. Many risk factors and disease states such as coronary artery calcification, osteopenia, and carotid stenosis are routinely reported on medical imaging when incidentally detected. This reflects their clinical significance and their ability to be treated or modified in a cost-effective manner. Like these other disease states, obesity is important, there is a latent stage, and the natural history is reasonably well understood. Assessing obesity on scans performed for other reasons is essentially free, requiring minimal extra resources (beyond a small time or software commitment) and without risk to the patient. There are established treatments for obesity, with reasonable consensus on who to treat. In light of these qualities, the interrogation of radiology scans for obesity satisfies many or all of Wilson's criteria for screening tests.(9)

Visceral obesity on medical imaging correlates with a wide range of surrogate markers (such as LDL cholesterol, glucose, triglycerides, and inflammatory markers)(2). CT-derived abdominal visceral fat (AVF) is also strongly correlated with anthropomorphic measures such as BMI and waist circumference (r = 0.72 and 0.77). CT-derived AVF is associated with a significant in-crease in all-cause mortality (OR 1.83). Cross-sectional area of abdominal visceral fat at the level of the L4-L5 intervertebral disk space is well-studied; below 100cm^2, disturbances disturbances of glucose, insulin, and lipid–lipoprotein metabolism are uncommon. An absolute area of AVF >100 cm^2 has been suggested as an indicator of overweight status, corresponding to a BMI >25cm^2/m^2 , while an area of >130 cm^2 approximates obesity, although the exact levels are subject to race and gender variation. For every additional 10 cm of fat on a single cross-sectional image, the risk of hypertension increases by 4%–9% and the risk of diabetes increases by 4% (3). A working example of this technique for assessment of abdominal visceral fat is provided using freely-available software (Fig 6) (3). Furthermore increased adipose tissue on imaging has been linked to poorer survival following both oncological surgery and chemotherapy, and is a risk factor for a range of pre-malignant and malignant conditions(10-12).

Using freely available software, levels of adiposity can be quantified using a variety of techniques(13, 14). Measuring cross-sectional area of abdominal visceral fat at the level of a specific lumbar vertebra on CT is the most widely employed technique, however other measurements and modalities may be used, and comparison can be made with available gender- and race-specific ranges. As computational power and machine learning progress, it is likely that this will become a widespread and automated feature of future radiology systems, along with a host of other epidemiological data points. The social stigma of obesity is unique however, thus warranting such an exploration of obesity reporting attitudes, as distinct from a range of other epidemiological findings.

The routine screening for obesity in all populations is recommended by numerous healthcare organisations including the US Preventive Services Task Force, the World Health Organization and the Canadian Task Force on Preventive Health.(15-17) Given the ubiquity of modern diagnostic imaging (particular CT and MR) and their superiority in both diagnosing overweight / obesity and in quantifying obesity, radiologists are well placed to extend screening into medical imaging departments. To date, no published literature has assessed if clinicians want this information, how they want it, and how they would use it. Nor have attitudes amongst those actually involved in medical imaging been investigated(18). This single institution study demonstrates that clinicians appear to desire quantitive information on obesity. Clearly obesity is a sensitive issue, with myriad social implications beyond healthcare.(19) Overall, clinicians felt that describing obesity would not be insulting in the context of a radiology report. As one respondent wrote, it may indeed be “less insulting than the eyeball test” which is often the de-facto alternative. Clinicians agreed that such a report would increase their willingness to confront patients on weight-related issues. Clinicians strongly stated they would not stop referring to radiology if obesity was reported, which may reassure reporting radiologists.

Several limitations exist within this study. There is no published literature describing what degree of difference in clinician attitudes to obesity reporting is clinically significant. Furthermore, given the paucity of previous studies, we were unable to know if attitudes to obesity amongst clinicians or patients is normally distributed. As such, this study and the accompanying surveys are designed as exploratory investigations. The largest meeting of both medical and surgical directorates in a single institution was chosen as a representative and accessible target group. This study is therefore limited by its relatively small sample size, however the narrow distribution of standard deviations does reveal general agreement across items. This small sample-size limits the ability to perform meaningful subgroup analysis based on clinicians' speciality or grade, and the ability to perform deeper statistical analysis. In both patients and clinicians, the number of non-responses was not recorded due to practical difficulties in recording physical survey responses and non-responses whilst preserving anonymity. Furthermore, out of hospital referrers (specifically general practitioners) were not surveyed. Although this group accounts for a relatively small share of cross-sectional imaging referrals in the surveyed institution, it is possible that attitudes differ amongst this group, or that attitudes could change in the future if such results were being provided. As a single site study, results may not be generalisable across sites. This may be particularly true given the variable perceptions of weight-related issues across cultures and societies worldwide. Patient profile data was nor surveyed, and it is possible that the presented findings are not generalisable to certain as-of-yet unknown subgroups. The questions asked of clinicians and patients were similar in content, the wording slightly differed as described, reflecting an attempt to optimise comprehension in both groups. Medical words were simplified, and the first-person was switched to the third-person as appropriate. This may limit the direct comparison of the relevant responses. Finally, this study assessing the attitudes of clinician and patient attitudes towards potential scan results, rather than actual scan results. Should such reporting become standard, repeat assessment to ensure that attitudes remain constant is warranted.

The diagnosis and quantification of obesity, on scans performed for any reason, is possible. Increasing computing power and machine learning are likely to simplify this process, providing radiologists and clinicians with a powerful prognostic measure. Despite the unique social factors relating to obesity, this study suggests clinicians and patients desire obesity-related information on radiology reports, and would find the information helpful in informing clinical decisions, and in facilitating the discussion of obesity with individual patients.

CONCLUSION

In this exploratory survey, both patients and clinicians stated they would prefer if overweight / obesity was described on radiology reports of scans done for any reason. The preference is for quantitive results amongst both groups, with both patients and clinicians believing such information would be useful with regards to medical management, and to permit an informed discussion of patient weight. Both clinicians and patients felt that such information was unlikely to cause insult. As new semi-automated and automated tools permit volumetric fat analysis within software programmes, this study suggests that such information would be considered valuable by both clinicians and patients alike and merits inclusion in radiology reports.

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FIGURE LEGENDS

Figure 1a. Clinician question - "Where overweight/obesity is present on medical imaging performed for any reason, I believe it should be included in the accompanying radiology report."

Strongly disagree = 1; Disagree = 2; Somewhat disagree = 3; Undecided = 4; Somewhat agree = 5; Agree = 6; Strongly agree = 7

Figure 1b. Patient question - "Where overweight/obesity is present on a scan performed for any reason, I believe it should be included in the accompanying scan report."

Strongly disagree = 1; Disagree = 2; Somewhat disagree = 3; Undecided = 4; Somewhat agree = 5; Agree = 6; Strongly agree = 7

Figure 2a. Clinician question - "I feel that a radiology report describing overweight/obese would be considered insulting by patients."

Strongly disagree = 1; Disagree = 2; Somewhat disagree = 3; Undecided = 4; Somewhat agree = 5; Agree = 6; Strongly agree = 7

Figure 2b. Patient question - "I would consider a scan report describing the presence of obesity as insulting."

Strongly disagree = 1; Disagree = 2; Somewhat disagree = 3; Undecided = 4; Somewhat agree = 5; Agree = 6; Strongly agree = 7

Figure 3a. Clinician question - "I would avoid sending patients for scans if I felt the scan would report overweight/obesity."

Strongly disagree = 1; Disagree = 2; Somewhat disagree = 3; Undecided = 4; Somewhat agree = 5; Agree = 6; Strongly agree = 7

Figure 3b. Patient question - “I would avoid going for scans if I felt the scan would report over-weight/obesity.”

Strongly disagree = 1; Disagree = 2; Somewhat disagree = 3; Undecided = 4; Somewhat agree = 5; Agree = 6; Strongly agree = 7

Figure 4a. Clinician question - “I would be more likely to discuss overweight/obesity with a patient if it was described in a radiology report”.

Strongly disagree = 1; Disagree = 2; Somewhat disagree = 3; Undecided = 4; Somewhat agree = 5; Agree = 6; Strongly agree = 7

Figure 4b. Patient question - “I would be more likely to discus overweight/obesity with my doctor if it was described in a scan report”.

Strongly disagree = 1; Disagree = 2; Somewhat disagree = 3; Undecided = 4; Somewhat agree = 5; Agree = 6; Strongly agree = 7

Figure 5a. Clinician question - “A radiology report describing overweight/obesity would influence my patient management decisions.”

Strongly disagree = 1; Disagree = 2; Somewhat disagree = 3; Undecided = 4; Somewhat agree = 5; Agree = 6; Strongly agree = 7

Figure 5b. Patient question - “A scan report describing overweight/obesity would influence decisions I make with regards to my health and wellbeing.”

Strongly disagree = 1; Disagree = 2; Somewhat disagree = 3; Undecided = 4; Somewhat agree = 5; Agree = 6; Strongly agree = 7

Figure 6. Axial CT image at the level of L4-l5, demonstrating semi-automated fat segmentation.