Author's response to reviews

Title: Documentation and Control of Body Mass Index and Associated Risk Factors in a Large Primary Care Network

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Author's response to reviews: see over
Dear Editors:

I am writing to resubmit our revised manuscript entitled “Documentation and Control of Body Mass Index and Associated Risk Factors in a Large Primary Care Network” for review. I have revised my paper in light of the comments from the peer review, and am providing a point-by-point response to the comments made.

We feel that our manuscript is appropriate for the BMC audience. In this manuscript we evaluate the implications and impact of the new HEDIS BMI criteria, which we think will be of great interest to the readers of the BMC. Our study uses a large diverse primary care network to evaluate documentation of BMI, and documentation and control of associated risk factors by BMI category. It is timely, especially with the prominence of BMI assessment as a newly proposed reportable HEDIS measure. This measure has the potential to provide a timely quality and safety foundation to improve care for patients with obesity.

The manuscript is not currently under review elsewhere and has not been published in any other peer-reviewed media. All authors have contributed sufficiently to this project to be included as authors, and have read and approved the manuscript. Furthermore, none of the authors have competing interests.

This work has been presented in poster form at the Regional New England Society of General Internal Medicine Conference in March of 2008, the Massachusetts Medical Society Poster Symposium in April of 2008, where it was the Second Prize Winner for Clinical Research, the Massachusetts General Hospital Clinical Research Day in May of 2008, and the North American Association for the Study of Obesity Annual Meeting in October of 2008.

Below are the comments provided by the two reviewers and the Associate Editor. I have separated them into bullet points and addressed each one separately. We thank the reviewers and Associate Editor for their thoughtful comments.

Reviewer 1:

- [Paper] would be improved by being shortened to the objective of assessing measurement of risk factors rather than analysis of the levels found.

Our study looks at body mass index (BMI) documentation and associated risk factor documentation. We then compare the association between BMI level and associated risk factor control. Finally, we look at the association between BMI category and risk factor documentation and control in the presence of absence of cardiovascular disease (CVD) or diabetes (DM). We are not analyzing the levels of the risk factors we are documenting; rather, we are using the standard cutoff points that are used to define control of these risk factors as a means of determining whether BMI category makes a difference in their control. We would argue that this analysis is important because it highlights the differences that exist between patients with and without CVD and DM and documentation and level of BMI.
Title: I’m not sure that “control” is the right word for BMI. We speak of control of BP because we have powerful tools to influence it, but as doctors we do not have much control over BMI.

While we agree that physicians have many challenges in the prevention and treatment of overweight and obesity, we would argue that primary care physicians do have some influence in that regard, and should work to improve their role in its treatment. However, we do agree that “control” may be used improperly, since we speak less of actual control and more in terms of the level of BMI and its relation to risk factor level. We removed this terminology for better clarity.

Abstract: The first line needs context. Which system will have BMI as a reportable health measure? This certainly does not apply in my country.

We agree that it is important to take the international audience into account. We changed this to: 
“Body mass index (BMI) will be a reportable health measure in the United States through implementation of Healthcare Effectiveness Data and Information Set (HEDIS) guidelines.”

Likewise, in considering an international audience SI units should be used, (with mg/dl in brackets for those that understand them.) We changed this to include SI units.

Methods in the abstract should include the ages of patients. Were these only adult patients? We added a comment letting people know that these are only adult patients (≥18 years of age).

Background: The context for this work includes a few points that haven’t been included: As a predictor of disease risk, abdominal girth is a much better measure than BMI. Physical activity is also a key risk factor, but much harder to measure. It should be part of the PHC record.

We agree that waist circumference is an important measure. Many studies have shown abdominal girth to be independently associated with adverse outcomes. Unfortunately, neither this measurement nor physical activity measurement was available in the electronic medical record that we used, and therefore, it is not available for this study.

Primary care provides both episodic and continuing care, and consideration of long standing risk factors is part of continuing care but may be inappropriate in episodic care especially for acute problems.

We agree with the statement that consideration of long-standing risk factors may be inappropriate in episodic care. For this reason, we were careful to take this into consideration by looking at patient care visits that would most likely be considered continuing care. As stated in the methods, in this study we looked at patients who had at least two clinic visits billed to their listed primary care physician, and not to another physician whom the patient might have seen during an urgent care visit. Furthermore, we used a broader time frame in order to capture data that would likely be measured on an annual basis.

Methods: All abbreviations must be spelled out.

We have included a list of abbreviations on the cover page, and have also spelled out every abbreviation out the first time it is used.

What is a PCP?
A PCP is a primary care physician. This has been spelled out the first time it is used, and will also be placed in a list of abbreviations on the cover page.

- **How big is seven feet?**
  We have converted all measurements to include SI units.

- **The setting should include details of the clinical software. Is this a commercial product? Ease of use and common errors vary between systems.**
  We changed this in the paper to make this clearer. The clinical software used to search was the electronic health record used by the Massachusetts General Hospital (MGH) primary care network, a network of twelve clinical practices that make up the MGH Primary Care Practice-Based Research Network (PBRN). These twelve practices use a common EHR that contains all clinical and utilization data for each patient. The data from the EHR data are searchable in the Research Patient Data Repository (RPDR) ([http://www.lcs.mgh.harvard.edu/projects/rpdr.html](http://www.lcs.mgh.harvard.edu/projects/rpdr.html)).

- **As the base for a quality improvement cycle, distinction should be made between data entered into the proper field rather than numbers scattered through the progress notes.**
  >85% of the data were available form the coded fields of the notes, depending on the variable. Very little was added in terms of data form the encountered notes retrieved by natural language processing; however, we felt strongly that the addition of this technique added to the completeness of our study.

- **Risk factor & CVD measurement: The second paragraph suggests that CVD risk factors are used as part of the definition of CVD. It is totally inappropriate to confuse risk factors with disease states.**
  We agree with this comment. We did not use risk factors to define disease states. We believe you may be referring to the following: “We defined clinical diabetes as diabetes on the EHR problem list and a diabetes medication on the medication list, or as having two outpatient or one inpatient codes related to diabetes. We have shown that this approach combined with abnormal risk factor levels has a sensitivity of >98% and specificity of >97% for CVD or diabetes when compared to the gold standard of trained research nurse chart abstraction (24, 25). We used the same approach as for diabetes to define hypertension and hyperlipidemia.”

To clarify, in our study we defined diabetes as: diabetes on the electronic health record problem list and a diabetes medication on the medication list, or as having two outpatient or one inpatient codes related to diabetes, and defined cardiovascular disease, hypertension, and hyperlipidemia in a similar fashion. We did not use abnormal risk factor levels to define diabetes or cardiovascular disease. The definitions of diabetes, hypertension, hyperlipidemia and CVD have previously been validated, and the sensitivity of our approach for diabetes or CVD are >98% and specificity of >97% compared to the gold standard of trained research nurse chart abstraction.

- **It is unclear of the role of the EHR problem list and the ICD codes. Are these separate? Why? Are they both complete for each patient or do they have one or the other?**
As stated above, we used International Statistical Classification of Diseases and Related Health Problems (ICD-9) codes and electronic health record (EHR) problem lists as a means of defining diabetes, cardiovascular disease, hypertension, and hyperlipidemia. ICD-9 codes are used in the United States as a method of classifying disease states for billing purposes, and ICD-9 information comes from billing data. EHR problem lists are coded fields in the medical record. They are separate and independent data sources that combined are used to create the disease categories such as diabetes, CVD, etc. Neither EHR problem lists nor ICD-9 codes are usually entirely complete and accurate. For that reason we looked at both as a means of better capturing patients with these comorbidities.

- **Discussion:** Too long. I think it would be improved by limiting the focus to the measurement and recording of risk factors, which I think is the key objective of this paper. Analysis of the levels of risk factors found is a different issue.

Thank you for this comment. We have gone back through the discussion and attempted to simplify and clarify our goals, and shortened where possible.

- I don’t see discussion of the availability of measuring equipment. Does every practice have a stadiometer? Who uses it? Is there one in every consulting room? Those without a BMI measurement are mostly lacking a height rather than a weight.

Yes, every practice has a stadiometer. They are not all in the consulting rooms; rather, they are usually available for nursing staff to use at the time a patient checks in, and patients are typically checked in and have height and weight measured and recorded in a uniform fashion by the nursing staff.

It is true that we are typically missing height. As stated in the paper, “We obtained BMI from height and weight data recorded in the EHR, where they are used to automatically calculate and display BMI. For this analysis we calculated BMI from the most recent weight in the 18-month period and the most recent height prior to 12/31/06 from structured coded entries in the EHR. For completeness, we also searched the text of narrative notes in the EHR using a validated Natural Language Processing abstraction tool that computationally abstracts weight, height, and BP values from the free text of clinician notes. (18,19). The sensitivity and specificity of the approach to abstraction (compared with a trained chart abstractor) are 87.9% and 99% for detection of height, 91.8% and 92.1% for detection of weight, and 91% and 96% for detection of BP (18,19). Because of high rates of missing heights, we confirmed with clinic site medical directors that we had searched in all the appropriate places in the clinical record for height and weight information.”

Other studies using EHR height and weight data to evaluate BMI have found it to be highly sensitive and specific. Please see Hivert MF, Grant RW, Shrader P, Meigs JB. Identifying primary care patients at risk for future diabetes and cardiovascular disease using electronic health records. BMC Health Serv Res. 2009 Sep 22;9:170 (number eighteen on reference list). They found that “The thresholds for BMI and weight in the EHR used as surrogate criteria (see Table 1) had a sensitivity of 88% and specificity of 87% (c-statistic = 0.876) to predict central obesity defined by waist circumference >40” in men, and >35” in women.”

**Reviewer 2**

**Major compulsory revisions**
One possible limitation that has not been addressed by the authors is the validity of the data. It seems a very high level of control in a “normal” clinical practice attending a population with a 30% obesity prevalence. More than 40% of diabetic patients show all three risk factors controlled. In NHANES study only 7.3% attained recommended goals of HbA1c level less than 7%, blood pressure less than 130/80 mm Hg, and total cholesterol level less than 200 mg/dL (5.18 mmol/L) (Saydah SH et al. JAMA 2004;291:335–342). Thank you for making us aware of this study. The paper you are quoting looked at individuals using NHANES III (1988-1994) and NHANES 1999-2000, comparing the two time periods, and looking at control of vascular disease risk factors (HbA1c, total cholesterol, and blood pressure) in patients with diabetes to see if control had changed. Overall, prevalence of control of all three risk factors in patients with diabetes was found to be 7.3% using information from NHANES 1999-2000, similar to the finding of 5.2% from NHANES III.

This study is different from our study for a couple of reasons. Saydah et al uses a national sample of respondents, and it is very likely that not all of these people are under the care of a physician. Our sample, on the other hand, consists of people who are receiving routine primary care, so it would be expected that our sample who have a higher level of control of their risk factors. Secondly, all the patients in Saydah et al’s study have diabetes, and not all of our patients do. In our study, of patients with a BMI documented (n=48,376) only 12% had a history of diabetes; therefore, presumably those without a history of diabetes are more likely to have fasting in control, bringing our number much higher than the subjects in the study quoted by the reviewer.

- It is surprising too that cholesterol test were ordered on most obese patients than fasting glucose (78% vs 37%). Is cholesterol testing a “capillary blood test” and fasting glucose a “plasma glucose test”? Is “casual glucose” a “capillary blood test”? How can the authors explain these differences? Test monitoring using capillary blood has advantages over laboratory venous glucose testing because the results can be obtained rapidly at the “point of care,” where therapeutic decisions are made. Testing to detect pre-diabetes and type 2 diabetes in asymptomatic people should be considered in adults of any age who are overweight or obese (BMI >=25 kg/m2) (Standards of medical care in diabetes--2009. American Diabetes Association. Diabetes Care. 2009 Jan;32 Suppl 1:S13-61).

These were all plasma glucose levels. Casual glucose was defined as a non-fasting glucose.

- A pay-for-performance scheme based on meeting targets for the quality of clinical care could increase the rate of improvement in the quality of care. Were there “pay-for-performance” scheme in the Practices?

No, there was no pay-for-performance scheme in place at this time.

- Bivariate analysis has been made to compare patients with or without documented BMI. Multivariate analysis must be performed for a more accurate conclusion. The same could be said for analyzing associated factors to obesity. To clarify, our study actually only looked at patients with a BMI, because the purpose of the paper was to compare documentation and control of risk factors by BMI category. Therefore, patients without the components necessary to calculate BMI (height and weight) were automatically excluded. In our first supplemental table we show the results of a bivariate analysis
demonstrating differences between patients with and without a BMI recorded. The purpose of that analysis was simply to demonstrate to the readers the differences in patients with and without BMI recorded in our population. Otherwise, patients without a BMI are not part of the study.

- **I think the paper could improve its interest if the causes of variability for registration/control between practices were performed.**
  
  We agree with this comment. Unfortunately, this is out of the scope of this current study. However, as stated in the paper, because of high rates of missing heights, we confirmed with clinic site medical directors that we had searched in all the appropriate places in the clinical record for height and weight information.

**Minor essential revisions**

- **Conclusions are very large. It must be shorter according to the objectives.**
  
  We have gone through the conclusions and focused them more according to the objectives of the study.

**Associate Editor:**

- **The Tables are given as a separate file, but those that are to be discussed in the paper (all 6 it seems) could be included in the paper and relabelled 1 - 6.**
  
  We have gone through and added all the supplemental tables to the main body of the paper.

- **The plots are missing the symbols A,B, …F**
  
  This has been corrected.

- **In Table 2 the percentages do not add to 100% for race. If this is due to missing, then include them as a separate line. Else recalculate the per cents.**
  
  We changed the footnotes to read that “other” category was deleted from the set.

Thank you again to the reviewers and the Associate Editor for their thoughtful comments. Please let us know if you have any questions. Thank you for your consideration. We look forward to hearing from you.

Sincerely,

Stephanie A. Rose