Author's response to reviews

Title: Toward cost-effective staffing mixes for VA substance use disorder treatment programs

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

Thank you for your constructive feedback. We have carefully considered your comments and suggestions. In the following page, we tabulated what we have revised in response to the feedback.

Deeply thank you.

Sincerely yours,

Jinwoo J. Im on behalf of the authors.
### Response to recommendations

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>Response</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the title instead of abbreviation, please use the actual name of VA.</td>
<td>We replaced VA with Veterans Affairs in the title as recommended.</td>
<td>Referee 1</td>
</tr>
<tr>
<td>2</td>
<td>Line 49, please use the lower case for fiscal year.</td>
<td>We revised as recommended.</td>
<td>Referee 1</td>
</tr>
</tbody>
</table>
| 3      | The statistical analysis should be mentioned in the abstract’s methods section (e.g., stepwise regression and GRG). | “We derived prediction functions…” → “We used a stepwise method to derive prediction functions…”
“…optimization problems to determine recommended staffing mixes that maximize net benefits per patient for four types of SUDTPs…” → “…optimization problems to determine recommended staffing mixes that maximize net benefits per patient for four types of SUDTPs by using the solver function with the Generalized Reduced Gradient algorithm in Microsoft Excel 2010…” | Referee 1 |
<p>| 4      | Please provide the baseline and sensitivity analysis rate in the abstract. | We added “We conducted sensitivity analyses by varying the baseline severity of addiction problems between lower (2.5%) and higher (97.5%) values derived from bootstrapping.” | Referee 1 |
| 5      | Please provide the dollar amount of savings annually in the abstract. | “Compared to the actual staffing mixes in FY01-FY03, the recommended staffing mixes would lower treatment costs while improving patients’ outcomes.” → “Compared to the actual staffing mixes in FY01-FY03, the recommended staffing mixes would lower treatment costs while improving patients’ outcomes, and improved net benefits are estimated from $1,472 to $17,743 per patient.” | Referee 1 |</p>
<table>
<thead>
<tr>
<th></th>
<th>In line 85, please provide some of the services being offered by VA to veterans.</th>
<th>We think lines 96-108 (&quot;VA operates four types of SUDTPs ... generally focusing on relapse prevention and maintenance of initial treatment gains in stabilized patients.&quot;) cover the comment. Please let us know whether you agree.</th>
<th>Referee 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Please provide separate section for your assumptions.</td>
<td>We fully understand the value of the comment; however, we prefer to provide the assumptions in the context. Please let us know whether you agree.</td>
<td>Referee 1</td>
</tr>
<tr>
<td>8</td>
<td>Please provide a table to describe 12 different staff types and the cost associated with each staff type.</td>
<td>We created a table (Table 1 Staff types and FY01-FY03 average wages).</td>
<td>Referee 1</td>
</tr>
<tr>
<td>9</td>
<td>Briefly describe the database you mentioned inline 196.</td>
<td>“The OMP sought to collect representative patient outcome data by randomly selecting a sample of programs and samples of their patients [23]. The OMP collected baseline and “6-month” follow-up data on patients in VA SUDTPs in three annual cohorts from FY01 to FY03 [23] and…” → “The OMP sought to collect representative patient outcome data by randomly selecting a sample of programs and samples of their patients, and collected baseline and “6-month” follow-up data on patients in VA SUDTPs in three annual cohorts from FY01 to FY03 [23]. Compared with the previously mandated system-wide monitoring system, the OMP achieved a higher follow-up rate without paying patients for their participation (67% vs. 15-21%) [23].”</td>
<td>Referee 1</td>
</tr>
<tr>
<td>10</td>
<td>Use a separate table to better demonstrate the results from the sensitivity.</td>
<td>We intended to only focus on the results, and used sensitivity analyses to confirm the robustness of results.</td>
<td>Referee 1</td>
</tr>
<tr>
<td>11</td>
<td>The presentation is a little odd, it looks as though you include the beta values in the &quot;Prediction functions&quot; column. Please clearly report beta value, the level of significance and the CI 95%.</td>
<td>We think the reviewer’s comment is reasonable; however, we also believe that providing more statistical values in the tables would look too busy. Please understand.</td>
<td>Referee 1</td>
</tr>
</tbody>
</table>
12. In line 114 it is recommended to include the define the different staffing mixes.

   Given the differences in the treatment focus and services required by patients in each of the four types of SUDTPs, their staffing mixes can be quite different. → “Given the differences in the treatment focus and services required by patients in each of the four types of SUDTPs, their staffing mixes can be quite different (e.g., 6% psychologists for inpatient vs. 1% for outpatient).”

Referee 1

13. I would recommended moving line 90-102 after the citation # 2 in line 85.

   We revised as recommended.

Referee 1

14. You need to expand your short coming section and include the following items:
   - The actual follow up of patients is very short (e.g., 7.4 months).
   - You need to discuss the implications of not including the patients in the methadone treatment.
   - Please discuss the implications of improvements in terms of quality of life improvements.
   - Your model does not account for retirement, promotions or increased wages.
   - Also you need to clearly acknowledge that your data is fairly old and since the noted period there has been many new innovations that had been implemented such as the use of computer simulations to help people who are diagnosed with PTSD.

   We reinforced the ‘5. Limitations’ section as recommended.

Referee 1

15. Please move the IRB statement to the beginning of the

   We revised as recommended.

Referee 1
methods section.

<table>
<thead>
<tr>
<th>16</th>
<th>Citation 47 in line 489 is from 2007, please briefly describe the current stage of training for US doctors.</th>
<th>We updated the statement based on the remarks by Deputy Secretary Sloan Gibson, presented on September 23, 2015 as follows: “For example, 70% of U.S. physicians have received at least some of their training at VA hospitals.”</th>
<th>Referee 1</th>
</tr>
</thead>
</table>
| 17 | On page 5 the authors note that this study aims to demonstrate how cost-effective staffing mixes for each type of program can be defined empirically instead of intuitively deriving “staffing solutions” for treatment programs. A similar statement in the conclusion notes that staffing in SUDTPs has been an intuitive process. Despite observing variation in staffing levels across similar programs, it is unclear what aspect of the staffing process the authors feel is “intuitive”. Further clarification and a citation supporting these statements is warranted. | We revised the sentences as below:

“This study aims to demonstrate how cost-effective staffing mixes for each type of VA SUDTPs can be defined empirically instead of intuitively deriving ‘staffing solutions’ (deleted) for the treatment programs.” → “This study aims to demonstrate how cost-effective staffing mixes for each type of VA SUDTPs can be defined empirically for the treatment programs.”

“Staffing SUDTPs has been an intuitive process.” → “There has been no systematic empirical method for staffing SUDTPs.” | Referee 2 |
| 18 | When describing their optimization model the authors note that (1) equation 3 specifies that a proportion for each staff should be in the range of those observed in treatment programs and (2) equation 4 specifies that the ratio of trainees to supervisors should fall within the observed range ensuring that we do not recommend too many trainees per supervisor. However, in their final recommendations there are huge increases in the number of paid trainees, aides and technicians, and clerical staff and drastic reductions in individuals that would likely serve as supervisors for trainees (Psychiatrists, Resident MDs, Nurse Practitioners, Psychologists, and social workers). This seems counter to the author’s prior | We deleted the phrase “…, ensuring that we do not recommend too many trainees per supervisor” for clarification.

“Equation 4 specifies that the ratio of trainees (e.g., resident MDs or other paid trainees) to supervisors (e.g., MDs or psychologists) should fall within the observed range, ensuring that we do not recommend too many trainees per supervisor (deleted).”

→ “Equation 4 specifies that the ratio of trainees (e.g., resident MDs or other paid trainees) to supervisors (e.g., MDs or psychologists) should fall within the observed ranges.” | Referee 2 |
This research raises important questions regarding the goal of treatment and how best to use the resources available. The authors emphasis on reducing time in treatment, which would allow more individuals access, glosses over the gains of the individuals seeking care. Based on their analysis individuals "completing" treatment met certain outcomes, yet these outcomes are not mentioned in the context of the research findings and should be noted. Somewhat related to the comments above regarding a focus on outcomes, it would be important for the authors to mention in their discussion section that substance abuse treatment is a complex chronic condition that may require individuals seeking care to cycle through multiple times or to engage with different sectors of care for different periods of time over their lifetime. This recognition has important implications for staffing patterns. Additionally, the authors need to recognize that many individuals seeking care, particularly within a military context, may suffer from other chronic health conditions or mental health disorders. This too has significant implications for staffing patterns.

We may need more clarification on the first point. We already provided patient outcomes in the form of monetary value changes in Table 5. For the other points, we already stated in the limitation section as below:

“Second, the present analyses include only VA SUDTPs and the findings may not generalize to other treatment settings. VA SUDTPs generally treat a population predominated by older male patients with chronic substance use disorders and high rates of psychiatric co-morbidity.”

Please let us know if our understanding does not align with your comments.

The authors do not touch upon the staffing requirements or licensure/accreditation requirement for programs that provide substance abuse treatment. This is an important consideration and was missing from the discussion section.

We put the following sentence in discussion for clarification.

“The staffing requirements or licensure/accreditation requirement for each type of programs were already reflected since observed ranges were used as constraints in the optimization problems.”

The influence diagrams for inpatient and residential and

We put the following sentence in the ‘3.2. Influence diagrams’
standard outpatient all have a box or bar in the arc from
treatment intensity to treatment length or patient status
after treatment. Yet there is no explanation given
regarding its meaning.

“For inpatient and residential programs, treatment length was
negatively associated with treatment intensity (e.g., more intense
treatments were provided for shorter periods), whereas there was
no significant correlation for intensive and standard outpatient
programs.”

The table highlighting the actual and suggested optimal
staffing mix for VA substance abuse treatment programs
was informative but difficult to assess the level of
change recommended. It would have been nice to see a
stacked bar diagram showing the change from actual to
suggested staffing levels or some other visual to
illustrate the recommended staffing mix changes more
clearly (see example below).

Thank you sharing the example. We created Figure 3 to visualize
the differences between actual and suggested staffing mixes for
each type of SUDTPs.

Descriptive statistics regarding the sample and how
these programs varied were not presented and would
have helped inform the reader.

We need clarification on this comment. Descriptive statistics on
SUDTPs are in the manuscript as follows.

“The actual follow-up point averaged 7.4 months (SD = 2.4
months) and the follow-up rate was 65.2%. In all, 5,548 patients
in 55 standard outpatient, 36 intensive outpatient, 39 residential
and 14 inpatient programs were assessed at baseline, and the
patients in the methadone programs were excluded from the
analysis.”

Also, descriptive statistics on patient status for each type of
SUDTPs are presented in Table 4.

I applaud the authors for casting a wide net and looking
at 12 different types of staff members in their analysis.
However in the supplemental information it would have

We created Table 1 to classify 12 types of staff members into 5
categories – prescribers, psychosocial rehabilitators, nurses,
support administrators, and trainees – while providing average

Referee 2
been nice to know more about the different types of providers selected and their roles. This would have better facilitated our ability to understand how staff member’s roles overlap, as well as the efficiency of the authors’ recommendations and the implications of changing staffing patterns based on these findings.

| 25 | Please clarify who provided access to the data in VA Outcomes Monitoring Project (OMP) database. Please include these details in the methods section of your manuscript. | We moved the following sentence to the front of section ‘2.2. Data’.

“The OMP was deemed an exempt project by the VA Palo Alto Health Care System/Stanford University IRB.” | Editorial requests |