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Title: A retrospective population-based analysis of wait times for cataract surgery in Ontario, Canada

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Reviewer 1: Dr. Jennifer Payne

Institution: Dalhousie University

General comments (author response in bold)

CMAJ Open Review – Mar 9, 2022 Title: A Retrospective Population-Based Analysis of Wait Times for Cataract Surgery in Ontario, Canada

Summary: This paper proposes a new approach to calculating wait times for cataract surgery (time to referral and time from recommendation to surgery) using classical administrative data sources. General Comments: This was an interesting paper – administrative data were used to estimate the wait times, an approach that might be able to overcome the known limitations/lack of standardization of the conventional approach. I think the paper could be strengthened by more clearly specifying the research objective, rather than framing the work under a high-level aim. This led to a stronger tie between the objective, the analytical plan, and the results.

We thank the reviewer for their thorough review and helpful comments to strengthen the manuscript. Based on the reviewer’s comments, we have now more clearly specified the research objective in both the Introduction and Methods.

Changes to the manuscript: Revision of the last sentence of the Introduction. The revised sentence reads: “The study objective was to use a repository of administrative health services records for the population eligible for universal health coverage in Ontario to estimate wait times for cataract surgery in Ontario, as well as the proportion of patients reaching WT targets set by the provincial government.”

Revision of three studies in the Statistical Analysis section of the Methods. The revised sentences read: “The primary objective was to characterize WT1 and WT2 for cataract surgery with this method via descriptive characteristics. WT1 and WT2 represented the study outcomes, both as categorical and continuous variables. The challenges and limitations of this data-driven method were examined.”

I would also like to see a stronger more precise recommendation in the concluding statements. If I understand correctly, the authors argue that the method may not be appropriately valid for both component wait times (W1 & W2). If that’s the case, it would then be impossible to use this method to report wait times according to provincial targets as the targets apply to the component wait times, and not as a sum to the summary wait time (W1 + W2).

The authors agree and have added a more precise recommendation for further work. Specifically, the creation of new billing codes (valued at \$0) at the time of referral would provide further accuracy to this method and would allow us to not have to use various sensitivity analyses to provide a range of wait times due to uncertainty in the date of referral. We recommend to the Ministry of Health that this should be implemented.

Changes to the manuscript: Addition of a sentence in the concluding paragraph of the Discussion. The new sentence reads: “The creation of new billing codes made at the time of referral should be explored as this would improve the accuracy of WT1 estimates.”

I think minor revisions would help strengthen this paper. Specific Comments:

ABSTRACT: Background – this section includes a statement of objectives, but no rationale – could a first sentence provide some insight into why a new approach to this calculation is being proposed?

The authors agree and have added a sentence in the Background section of the Abstract to this effect.

Changes to the manuscript: Addition of a sentence to the Background section of the Abstract. The new sentence reads: “There are concerns for inaccuracy in current methods used to estimate surgical wait times in Ontario.”

Methods – It would have been helpful to see a sentence describing the data sources (high-level) as many clinical readers will be unfamiliar with admin data – insured person, physician billing etc.

The authors agree and have added an appropriate statement. Due to word limit constraints, this description has been added to Appendix 2.

Changes to the Manuscript: Addition of the following sentences to Appendix 2: “OHIP data received by ICES contains claims paid for by the Ontario Health Insurance Plan. OHIP data includes health care providers such as physicians, groups, laboratories and out-of-province providers.”

Most of the section was used to describe detail of wait times measures – this could be shortened (WT1 – time to surgical referral, WT- recommendation to surgery) and should be framed as estimates/proxy measures given the nature of the data.

We have now framed WT1 and WT2 as estimates in the Methods. We believe the descriptions of how WT1 and WT2 are helpful for the reader to be able to understand our methodology and reproduce our methods.

The last sentence explaining priority is confusing – it’s not clear what the primary analysis is, and so hard to understand sentence.

We have now revised the sentence on priority to explain what the primary analysis was.

Changes to the manuscript: Revision of a sentence in the Statistical Analysis section of the Methods. The sentence now reads: “For the primary analysis using the ranking method, all patients were compared to the WT targets for priority 4 cases given that no information on surgical priority groups were available.”

Results - There is a reference to provincial targets – presumably this should be part of the rationale – ie that there are targets and that there are limitations to the current calculations, hence the opportunity of admin data.

We have provided reference to this as part of the rationale.

Changes to the manuscript: Addition of a sentence to the Introduction. The new sentence reads: “Limitations to the current methods may result in inaccuracies in the proportion of patients meeting provincial WT targets.”

Interpretation: I’m confused – is the wait time for each of time to referral and time to surgery 182 days? This sentence is confusing.

To improve clarity, we have deleted '182 days' from the Interpretation. The wait time for each of WT1 and WT2 is compared to 182 days as specified in the body of the manuscript.

Changes to the manuscript: Revision of a sentence in the Interpretation. The revised sentence reads: "With this method, 35.0% of Ontario cataract surgery patients in 2005-2019 did not receive initial consultation or cataract surgery within the provincial wait time target."

BACKGROUND: 'We hypothesize that WTs are overestimated or underestimated relative to true WTs depending on the surgeon or institution' – avoid 'hypothesize' as this is not the hypothesis being tested in this analysis.

'hypothesize' has now been changed to 'believe'.

'we are concerned'? - That said, this concern is the rationale that is missing from the abstract – concerns over validity

The authors agree and have added a sentence in the Background section of the Abstract to this effect.

Changes to the manuscript: Addition of a sentence to the Background section of the Abstract. The new sentence reads: "There are concerns for inconsistencies and inaccuracies in current methods used to estimate surgical wait times in Ontario."

'this study aims to evaluate the feasibility and potential issues of WT estimation via provider billing codes. We aim to report the WTs with the application of this method, as well as the proportion of patients reaching WT targets set by the provincial government.' – as I read this, I expect the methods to address 'feasibility' – how will this be measured? 'potential issues' sounds a bit non-specific - The objectives are to create a method to estimate WT1 and WT2 and to use this method to estimate these wait times – be direct with this statement. - By definition, a reflection on this method would be included in the discussion

Following internal review, we have removed mention of 'feasibility'. We have revised the objectives in both the Introduction and Methods to be more explicit. The discussion provides rationale on challenges and limitations of our new method.

Changes to the manuscript: Revision of the last sentence of the Introduction. The revised sentence reads: "The study objective was to use a repository of administrative health services records for the population eligible for universal health coverage in Ontario to estimate wait times for cataract surgery in Ontario, as well as the proportion of patients reaching WT targets set by the provincial government."

Revision of three studies in the Statistical Analysis section of the Methods. The revised sentences read: "The primary objective was to characterize WT1 and WT2 for cataract surgery with this method via descriptive characteristics. WT1 and WT2 represented the study outcomes, both as categorical and continuous variables. The challenges and limitations of this data-driven method were examined."

METHODS: 'The secure health services databases at the ICES were consulted by an experienced data analyst (M.H.)' – consulted? You mean accessed and used in the analysis?

We have revised the word ‘consulted’ to ‘accessed’ per the Reviewer’s comment.

Question: can nurse practitioners refer? The analysis seems restricted to family docs – please elaborate – this may differ by jurisdiction so important context to provide.

Nurse practitioners can refer to a specialist, however since they are not paid via billing to OHIP, nurse practitioner referrals could not be accounted for with our methods. We have specified this in the limitations section of the Discussion: “We did not consider referrals for cataract surgery that did not involve an optometrist, ophthalmologist or family physician.”

‘were aged 18 and older were considered for enrollment’ – being picky here, but I use the term enrollment in the context of consent/primary data collection – here the concept is really eligibility.

This has been revised per the reviewer’s comment.

Changes to the manuscript: Revision of a sentence in the Methods. The revised sentence reads: “Using the OHIP database, all individuals who had cataract surgery between January 1st, 2005, and December 31st, 2019 that were aged 18 and older were eligible for inclusion.”

‘Given that most cataract surgery referrals are made by optometrists, a ranking method was used for the primary analysis.’ – is there a definition of primary analysis? Is there a secondary one? I think it would be clearer to use these as subheadings or as introductory parts of sentences to be a bit clearer. E.g., there is not statement of ‘primary analysis’ in the stats section, only ‘secondary analysis’ – these headings are used in the results which is easy to follow

We have now revised the Statistical Analysis section of the Methods to specify the primary analysis and secondary analysis.

Changes to the manuscript: Revision of multiple sentences in the Statistical Analysis section of the Methods. The revised sentences read: “The primary analysis utilized the ranking method. Here, all patients were compared to the WT targets for priority 4 cases given that no information on surgical priority groups were available. To evaluate wait times across a differing set of assumptions, secondary analyses computed surgical WTs stratified by referral source and a subgroup analysis evaluated WTs in patients with a single referral and patients with multiple eligible referrals separately.”

The ranking of source of referral (optom, oph, PCP) to obtain date is much more clearly described here than in the abstract.

We have revised the Methods section of the Abstract to improve the clarity of this sentence.

Changes to the manuscript: Revision to a sentence in the Methods of the Abstract. The new sentence reads: “In the primary analysis, a ranking method prioritized referrals from optometrists, followed by ophthalmologists and then family physicians.”

‘Universal coverage of routine eye exams is covered for seniors and children, however is not available for those aged 20-64’ – awkward – available? ‘There is no provincial universal coverage of routine eye exams for those aged 20-64.’

This sentence has now been rephrased based on the Reviewer’s recommendation.

The last paragraph of this section speaks to inclusion/exclusion criteria for the cohort – could consider moving this detail under ‘cohort selection’.

We have now moved this section to the Cohort Selection subsection.

‘The primary aim of this study was to evaluate the feasibility, challenges, and limitations of this data-driven method to assess WT1 and WT2, and to characterize WT1 and WT2 for cataract surgery with this method via descriptive characteristics – the stats plan should relate to the objectives but again, I don’t see this statement as sufficiently precise as mentioned above and so the stats section doesn’t align perfectly with the stated aim, e.g., how were feasibility, challenges and limitations measured/addressed?’

We have restated our primary objective in both the Introduction and Methods.

Changes to the manuscript: Revision of the last sentence of the Introduction. The revised sentence reads: “The study objective was to use a repository of administrative health services records for the population eligible for universal health coverage in Ontario to estimate wait times for cataract surgery in Ontario, as well as the proportion of patients reaching WT targets set by the provincial government.”

Revision of three studies in the Statistical Analysis section of the Methods. The revised sentences read: “The primary objective was to characterize WT1 and WT2 for cataract surgery with this method via descriptive characteristics. WT1 and WT2 represented the study outcomes, both as categorical and continuous variables. The challenges and limitations of this data-driven method were examined.”

RESULTS The results section speaks only to the calculations, sensitivity analyses, and subgroup analyses. There are no explicit results supporting ‘feasibility, challenges, and limitations’ hence my comment to more clearly specify the objective.

The authors agree and as specified above, have revised the objectives to be in line with the reported results. The challenges and limitations have been described throughout the Discussion.

INTERPRETATION The first paragraph is a summary of the findings of the paper. Next, I would expect to see a comparison of these results to the standard approach and a reflection on why they may or may not differ, which then leads into strength/limitations of the proposed approach.

The authors thank the reviewer for this excellent suggestion. We have now compared our data from April 1, 2019 to September 30, 2019 with the WT2 data reported by CIHI over the same time period. This has been noted in the Discussion.

Changes to the Manuscript: Addition of two sentences to the Discussion, which read: “When compared to data from the Canadian Institute for Health Information, our median WT2 of 92 days was longer than the reported CIHI data (63 days) for April to September 2019.9 This emphasizes our conviction that current data submitted to CIHI, which are based on self-reported wait times, are likely underestimating the true wait times for cataract surgery.”

The second paragraph and much of the third paragraph appear to be out of order – this prose is more a rationale/conclusion – it interrupts the flow for the reader. Given the strengths/limitations presented, am I to interpret that the recommendation going forward is that this method should be used only to report the overall wait time, and not the component wait times of WT1 and WT2? (sentence at end of 3rd paragraph) .If that’s the

case, then this approach cannot actually be used to report the component wait times which are the ones for which there is a provincial target.

The authors agree that the logical flow of the Discussion section was previously out of order. We have removed the previous paragraph addressing the consequences of long wait times as this is well known and not the focus of the current manuscript. We have added in a paragraph on the comparison of our results to the published CIHI data. We believe these changes have strengthened the flow of the Discussion section.

To avoid reader confusion, we have removed the statement about the total WT as being the most reproducible measure. Instead, we have provided a new recommendation at the end of the Conclusion section which we hope is clear to readers.

Changes to the Manuscript: Removal of a previous paragraph addressing the consequences of long wait times.

Addition of a new paragraph to the Discussion: “When compared to data from the Canadian Institute for Health Information, our median WT2 of 92 days was longer than the reported CIHI data (63 days) for April to September 2019.6 This emphasizes our conviction that current data submitted to CIHI, which are based on self-reported wait times, are likely underestimating the true wait times for cataract surgery.”

Addition of the following sentences to the Conclusion: “While we believe that the reporting of WT2 is reproducible and accurate, there is an inherent uncertainty regarding WT1 due to the inability to identify the date of referral. The creation of new billing codes made at the time of referral should be explored as this would improve the accuracy of WT1 estimates.”

Reviewer 2: Dr. R. Jaakkimainen,

Institution: Institute for Clinical Evaluative Sciences, Sunnybrook Health Sciences Centre

General comments (author response in bold)

This is an important and well written paper which uses health administrative data to calculate wait times for cataract surgery. My comments are below.

The assumptions for calculating wait time 1 from optometrist or ophthalmologist to seeing a cataract specialist and the wait 2 measures are appropriate. In fact, the figures show consistent measures for wait 2.

The authors thank the reviewer for their review of our manuscript and helpful comments.

The challenge is to identify which family physician visit may be associated with a referral to a cataract specialist. The authors do address this to some degree in their sensitivity analyses. The sensitivity analyses for family physician referrals for wait 1 are different than the other measures. Many types of family physician billing codes were used to identify FP visits (including emergent assessments), however was there any work looking at the diagnostic code accompanying these billing codes? I suspect referrals for eye examinations would occur during periodic health examinations, but how often would referrals be completed during visits using counselling codes? Also, there is a limitation is that referrals are requested by patients outside of an appointment and not billed.

We agree with the reviewer. The challenge in evaluating diagnostic codes is that when scrutinizing our available data, a substantial proportion of diagnostic codes were not entered in the OHIP data, making such an evaluation not possible. We

agree that referrals requested by patients outside of an appointment would not be captured, and have now acknowledged this in the Limitations section of the Discussion.

Changes to the Manuscript: Revision of a single sentence in the Limitations section. The revised sentence reads: “We did not consider referrals for cataract surgery that did not involve an optometrist, ophthalmologist or family physician, as well as patient referrals that were requested outside of a billable appointment by a referring provider.”

The study cohort includes patients over 18 years of age. The authors do note that patients between 20 and 64 years do not have provincial coverage for eye examinations. Since they do not need a referral from a family physician to have an eye examination and the optometrists bill the patients directly, could there be some misclassification of the family physician referrals?

The authors acknowledge that misclassification based on referring provider is a possibility, and have now reported this in the Discussion alongside with a note that individuals who paid out of pocket for optometrist evaluation and referral for cataract surgery could have been misclassified.

Changes to the manuscript: Revision of one sentence in the limitation section of the Discussion. The revised sentence reads: “We acknowledge the possibility of misclassification of the referring physician, especially for individuals who paid out of pocket for optometrist evaluation and referral for cataract surgery.”

Could the sensitivity analyses be stratified to say those 20 to 64 and those over 65 years of age? I also suspect younger patients who have cataract surgery many be different from older patients referred for cataract surgery.

The authors have now conducted a sensitivity analysis between those 20-64 versus 65+ years of age and have added this to the manuscript.

Changes to the Manuscript: Addition of a sentence to the Methods: “A second subgroup analysis evaluated WTs based on patient age.”

Addition of a sentence to the Results: “Using the ranking method, the median WT1 and WT2 for patients aged 20-64 was slightly shorter relative to those aged 65 and over (WT1: 65 vs. 68 days; WT2: 68 vs. 79 days).”

In Table 2, how was the number of referrals calculated?

In Table 2, the number of potential referrals are calculated based on whether whether there was a valid billing code from an optometrist, ophthalmologist or family physician that could be used to date the beginning of WT1. If there were valid billing codes for all three of an optometrist, ophthalmologist or family physician, then this was considered 3 potential referrals.

Minor comment is how different are the health administrative wait time estimates from those wait times estimates provided by the surgeons.

The authors agree with the reviewer that our current data could be compared to the surgeon-reported data as reported by Ontario Health. However, Ontario Health only provides data at the current time. Wait times have changed considerably since the onset of the COVID-19 pandemic, and so comparing our data from pre-COVID and the current data from Ontario Health may provide for an unfair comparison. We have contacted representatives from Ontario Health to ask

whether retrospective wait time data could be shared with our team, however we were told that this was not possible.

Reviewer 3: Dr. Yanqing Yi

Institution: Memorial University of Newfoundland

General comments (author response in bold)

This manuscript explored the use of administrative data to estimate wait times for cataract surgery in Ontario. The Registered Person's Database that contains demographic information was linked to the Ontario Health Insurance Plan data to obtain the information on referral date, date of the decision made for surgery, and surgery date. To deal with the issues of multiple referrals and no decision made date recorded in the Health Insurance Plan data, the authors proposed a ranking method to determine referral date by ranking referrals from optometrist, external ophthalmologist, and family physician thus to calculate the wait time from referral to the first consultation for surgery (WT1). When there were multiple consultations with a surgeon before the surgery, the second last visit to a surgeon was used to compute the wait time from the decision made to the surgery performed (WT2). Sensitivity analysis was conducted on the change of referral date criterion of ranking to the earliest possible referral and the latest possible referral. The results showed that the median WT1 was very sensitive to the change of referral date determination method. This makes the results on WT1 less confidential.

The authors thank the reviewer for their thorough review and helpful comments. We agree that the median WT1 times were sensitive to the change of referral date determination method and have acknowledged this in the limitations: "With the administrative databases used, there is no identifier for the date of referral, so sensitivity analyses based on differing assumptions about the referring provider were used to recognize the uncertainty in these estimates. We acknowledge the possibility of misclassification of the referring physician, especially for individuals who paid out of pocket for optometrist evaluation and referral for cataract surgery." Our eventual goal is to use this study as a foundation to propose the creation of new referral-specific billing codes made at the time of referral which can be used to track the referring provider in the health administrative databases used.

Changes to the manuscript: Addition of a sentence to the limitations section of the Discussion. The new sentence reads: "The creation of new billing codes made at the time of referral should be explored as this would improve the accuracy of WT1 estimates."

1. How WT2 is related to referral? The results of median WT2 were reported for the earliest possible referral and for the latest possible referral on page 9 as well as in Figure 2b. It's unclear what conclusion you want to draw on WT2 for the three categories of referrals (Earliest Referral, Latest Referral, Ranking).

The authors agree and have removed the mention of WT2 from the sensitivity analyses of earliest referral and latest referral. Figure 2b has been deleted and the corresponding section in the Results has been removed.

2. The Canadian Institute for Health Information (CIHI) reports WT2 for priority procedures including cataract surgery

(<https://can01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.cihi.ca%2Fen%2Fexplore-wait-times-for-priority-procedures-across-canada&data=05%7C01%7Cmarko.popovic%40mail.utoronto.ca%7Cabb1c0ff26ed04f06>)

46ce08da2d01e901%7C78aac2262f034b4d9037b46d56c55210%7C0%7C0%7C637871783958203340%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6Ikl1haWwiLCJXVCi6Mn0%3D%7C3000%7C%7C%7C&sdata=crdOS0tirCEWNGncz76w34lvalnn4A5FW0Rb1o7IX%2BQ%3D&reserved=0) using booking date, a date when the patient and an appropriate physician agree to a service and the patient is ready to receive it. The results on WT2 should be compared with those reported from CIHI.

The authors thank the reviewer for this excellent suggestion. We have now compared our data from April 1, 2019 to September 30, 2019 with the WT2 data reported by CIHI over the same time period. This has been noted in the Discussion.

Changes to the Manuscript: Addition of two sentences to the Discussion, which read: “When compared to data from the Canadian Institute for Health Information, our median WT2 of 92 days was longer than the reported CIHI data (63 days) for April to September 2019.9 This emphasizes our conviction that current data submitted to CIHI, which are based on self-reported wait times, are likely underestimating the true wait times for cataract surgery.”

3. Ontario Health has an interactive tool to inform the public on WT1 and WT2 at different locations for surgeries including cataract surgery in a timely fashion (<https://can01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.ontariohealth.ca%2Four-work%2Fpublic-reporting%2Fwait-times-results&data=05%7C01%7Cmarko.popovic%40mail.utoronto.ca%7Cab1c0ff26ed04f0646ce08da2d01e901%7C78aac2262f034b4d9037b46d56c55210%7C0%7C0%7C637871783958203340%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6Ikl1haWwiLCJXVCi6Mn0%3D%7C3000%7C%7C%7C&sdata=AburwigDHZBP4Y24Gj4%2BCvJRp%2FAMdsgB5swvj0gYwsc%3D&reserved=0>). It will be of interest to compare the results with those reported by Ontario Health. Due to a lack of comparisons of the results on WT1 and WT2 with those reported by CIHR and Ontario Health, the results are in low confidence and the justification of the use of administrative health services data to estimate wait times for cataract surgery is weak.

The authors agree with the reviewer that our current data could be compared to the Ontario Health data. However, Ontario Health only provides data at the current time. Wait times have changed considerably since the onset of the COVID-19 pandemic, and so comparing our data from pre-COVID and the current data from Ontario Health may provide for an unfair comparison. We have contacted representatives from Ontario Health to ask whether retrospective wait time data could be shared with our team, however we were told that this was not possible.

4. Table 2 should be organized in a more informative way toward the analytical objectives. Table 2 included a lot of summaries that are not explained in the main text. **The former Table 2 is extensive and has been made an online-only appendix (Appendix 3). A more organized and relevant summary of Appendix 3 has now been designed (i.e. Table 1).**

Changes to the manuscript: As above.

5. The aims of the secondary/subgroups analysis are unclear.

The secondary/subgroup analyses are meant to provide a range of estimates owing to the uncertainty in the methodology presented. Given that assumptions were made in deriving the estimates of our primary analysis, these

secondary/subgroup analyses serve to provide WT1 and WT2 data under a different set of assumptions. This has now been clarified in the Methods.