# Abdominal aortic aneurysm screening in an academic family practice

## Short-term impact of guideline changes

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## Abstract

**Objective** To investigate abdominal aortic aneurysm (AAA) screening rates in the 6 months before and after the introduction of updated Canadian Task Force on Preventive Health Care (CTFPHC) guidelines to determine effects on practice patterns, as well as to determine whether certain patient characteristics impact AAA screening rates.

**Design** Retrospective chart review.

**Setting** Academic family health centre in London, Ont.

**Participants** Male patients between the ages of 65 and 80.

**Main outcome measures** Screening rates for AAA before and after the guideline update were compared using the normal approximation of the binomial distribution. Analysis of demographic characteristic effects on screening rates was completed with the Fisher exact test. Number of visits to the clinic with a primary care provider within the study period and imaging type were collected.

**Results** Of the 266 patients included in the study, 160 patients were eligible for screening at the start of the study period, 6 months before publication of the CTFPHC AAA guideline. Individuals eligible for screening visited the clinic an average (SD) of 2.44 (1.82) times in the 6 months before and 2.66 (1.99) times in the 6 months after. Overall, 69 individuals had AAA screening completed and 9 had a discussion of AAA screening without any imaging, for a total uptake rate of 88.5% for those who had screening recommended. The overall imaging rate was 48.9%. There was no statistically significant difference in screening rates between the time periods (*P*=.337) among those eligible for screening. For demographic characteristics for risk stratification, 7 individuals had a documented family history, of whom 5 had imaging of their abdominal aorta performed, plus 1 additional individual who had screening recommended but not completed. This was not statistically significant relative to the total population (*P*=.0598). Positive smoking status (active or ex-smoker) was more common, with 135 individuals having a relevant smoking history. Approximately half of these current and former smokers (68 individuals [50.4%]) had any sort of abdominal aortic imaging performed or recommended, which was not statistically significantly different compared with non-smokers (62 of 126 imaging performed or recommended, 49.2%; *P*=.9016).

**Conclusion** Screening practices did not change appreciably with the introduction of the CTFPHC AAA screening guidelines. Further research is needed to improve AAA screening rates. It is worth exploring electronic medical record–based reminders, nursing staff involvement in screening, screening programs via public health, and point-of-care ultrasound screening in a primary care setting.

## Editor's key points

- In September 2017, the Canadian Task Force on Preventive Health Care updated its abdominal aortic aneurysm guidelines to a weak recommendation for one-time screening for all men between the ages of 65 and 80.
- When comparing screening rates before and after the guideline update, there was no significant difference.
- Even though evidence and guidelines recommend screening for men who smoke, there was no statistically significant difference compared with non-smokers.
- Future research is needed on finding ways to improve abdominal aortic aneurysm screening, with considerations for implementation of electronic medical record–based reminders or point-of-care ultrasound screening in a primary care setting.

## Points de repère du rédacteur

- En septembre 2017, le Groupe d'étude canadien sur les soins de santé préventifs actualisait ses lignes directrices sur les anévrismes de l'aorte abdominale et ajoutait une faible recommandation de procéder à un dépistage ponctuel chez tous les hommes de 65 à 80 ans.
- Une comparaison des taux de dépistage avant et après l'actualisation des lignes directrices n'a révélé aucune différence significative.
- Même si les données probantes et les lignes directrices recommandent un dépistage chez les fumeurs, il n'y avait pas de différence statistiquement significative entre fumeurs et non-fumeurs.
- D'autres recherches sont nécessaires pour trouver des façons d'améliorer le dépistage d'un anévrisme de l'aorte abdominale, tenant compte de la possibilité d'inclure des rappels dans les dossiers médicaux électroniques ou de procéder à un dépistage par échographie au point de service en milieu de soins primaires.

# Dépistage d'un anévrisme de l'aorte abdominale dans une clinique familiale universitaire

## Impacts à court terme des changements aux lignes directrices

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## Résumé

**Objectif** Examiner les taux de dépistage d'un anévrisme de l'aorte abdominale (AAA) durant la période de 6 mois avant et 6 mois après la publication des lignes directrices actualisées du Groupe d'étude canadien sur les soins de santé préventifs (GECSSP) pour déterminer les effets de l'actualisation sur les habitudes de pratique, de même que les influences de certaines caractéristiques des patients sur les taux de dépistage d'un AAA.

**Type d'étude** Une revue rétrospective des dossiers.

**Contexte** Un centre universitaire de santé familiale à London (Ontario).

**Participants** Les patients masculins de 65 à 80 ans.

**Principaux paramètres à l'étude** Les taux de dépistage d'un AAA avant et après l'actualisation des lignes directrices ont été comparés à l'aide d'une approximation normale de la distribution binomiale. Les effets des caractéristiques démographiques sur les taux de dépistage ont été analysés au moyen du test exact de Fisher. Le nombre de visites à la clinique pour consulter un professionnel des soins primaires et le type d'imagerie subie durant les périodes à l'étude ont été recueillis.

**Résultats** Au nombre des 266 patients inclus dans l'étude, 160 étaient admissibles au début de la période à l'étude, 6 mois avant la publication des lignes directrices sur les AAA du GECSSP. Les hommes admissibles au dépistage ont visité la clinique en moyenne (ET) 2,44 (1,82) fois durant les 6 mois avant et 2,66 (1,99) fois durant les 6 mois après. Dans l'ensemble, 69 hommes ont reçu un dépistage d'un AAA et 9 ont eu une discussion à propos du dépistage d'un AAA sans étude par imagerie, ce qui représente un taux d'adhésion total de 88,5 % de ceux à qui le dépistage a été recommandé. Le taux total d'études par imagerie était de 48,9 %. Il n'y avait pas de différence statistiquement significative dans les taux de dépistage entre les 2 périodes ($p$=,337) parmi les patients admissibles au dépistage. En ce qui a trait aux caractéristiques aux fins de stratification du risque, 7 hommes avaient des antécédents familiaux documentés, dont 5 qui ont subi un examen par imagerie de leur aorte abdominale, plus 1 autre individu à qui on avait recommandé le dépistage, mais qui ne l'a pas subi. Cela n'était pas statistiquement significatif par rapport à la population totale ($p$=,0598). Le statut positif de fumeur (actif ou ex-fumeur) était plus courant, notamment 135 hommes ayant des antécédents de tabagisme pertinents. Environ la moitié des fumeurs actuels ou anciens (68 hommes [50,4 %]) ont subi ou se sont vu recommander un type ou un autre d'imagerie de l'aorte abdominale, ce qui n'était pas significativement différent sur le plan statistique par rapport aux non-fumeurs (62 des 126 études par imagerie effectuées ou recommandées, 49,2 %; p=,9016).

**Conclusion** Les pratiques de dépistage n'ont pas changé de manière appréciable à la suite de la publication des lignes directrices sur les AAA du GECSSP. D'autres recherches sont nécessaires pour améliorer les taux de dépistage d'un AAA. Il y aurait lieu d'explorer la possibilité d'inclure des rappels dans les dossiers médicaux électroniques, d'impliquer le personnel infirmier dans le dépistage, d'instaurer des programmes de dépistage par la santé publique et d'utiliser le dépistage par échographie au point de service dans les milieux de soins primaires.

Screening for abdominal aortic aneurysms (AAAs) has been a subject of some controversy, with recommendations for and against its use in various populations.[1-4] Screening has been shown to reduce AAA rupture and associated mortality (numbers needed to screen of 200 and 212, respectively), yet comes with the harm of increased number of operations (number needed to harm of 158) in addition to increased monitoring for those with positive results.[5] In September 2017, the Canadian Task Force on Preventive Health Care (CTFPHC) updated its guidelines (last published in 1991) from recommending neither for nor against screening due to insufficient evidence,[6] to a weak recommendation for one-time screening for all men between the ages of 65 and 80, regardless of other risk factors.[1] Notably, smoking status and family history do not affect the CTFPHC guidelines, aspects that have been previously incorporated into recommendations in other jurisdictions.[3,4] The updated guidelines bring the CTFPHC closer to other agencies, such as the Canadian Society for Vascular Surgery, which has recommended AAA screening for men aged 65 to 75 since 2007.[1,2] This reflects converging opinions on proper screening for AAAs. Indeed, after the CTFPHC guideline was announced, the Canadian Society for Vascular Surgery issued an update, concurring with the 65- to 80-year age range.[7] Yet, while Canadian statistics on AAA screening rates are not readily available, AAA screening has not been a widespread practice in Canada. International data affirm concerns that implementation of AAA screening by physicians is variable and generally quite low, with studies in the United States putting the average at around 40%.[8,9]

Lack of consensus on screening benefits and the type of population to be screened may have factored into reduced uptake for AAA screening in Canada. Moreover, international guidelines have been incongruent on this topic.[3,4] The US Preventive Services Task Force, for example, recommends screening only men 65 to 75 years old who have ever smoked, with selective screening for higher-risk men.[3]

However, even when there is consensus between AAA screening guidelines, uptake is often poor. There is rather strong agreement between jurisdictions that all men with a substantial smoking history should be screened once they hit the age of 65, yet American data show minimal attempted screening of the relevant population.[10] Patient factors also reduce completed screenings, with a British study showing a mean of 29.1% of men offered AAA screening not following through on that offer.[11] A 2012 Canadian study looking at office-based screening for AAA noted concerns about uptake, particularly in rural or remote areas.[12]

Screening, as with any beneficial preventive health measure, comes with barriers, such as costs and risks. Risks from AAA screening with ultrasound are anticipated to be small, as it is noninvasive and does not use radiation, while also having very low rates of false-positive and false-negative results.[12] However, psychological harms may arise due to distress from screening or monitoring.[13] The updated CTFPHC guideline takes both into account, noting that evidence of benefits versus harms leans toward benefits for the recommended screening group, while cost-benefit analyses from multiple angles have demonstrated that the practice of AAA screening for men aged 65 to 80 is likely cost-effective.[1,14,15]

The purpose of this study is to investigate AAA screening rates in a Canadian setting, with an emphasis on the period shortly before and after the introduction of the updated CTFPHC guidelines to determine any effect on practice patterns. A secondary objective is to determine whether certain relevant patient characteristics impact AAA screening rates.

## Methods

### Study information

This study was conducted as a retrospective chart review within an academic family health centre in London, Ont. All patients at the clinic were rostered to individual staff family physicians, although primary care, including preventive screening, was delivered by multiple family physicians, residents, and nurse practitioners in a collaborative care model. Patients were included in the chart review if they visited the clinic and saw a primary care physician or nurse practitioner between March 11, 2017, and March 11, 2018; if they were between the ages of 65 and 80 at the time of their visit; if they were of male sex; and if they were rostered to 1 of the 3 staff physicians who agreed to participate in the study. Patients were excluded if they had a previous history of symptomatic AAA before March 11, 2017. Dates of the study period were chosen to allow comparison of screening frequency 6 months before and after the publication of the updated CTFPHC AAA screening guidelines.

Demographic data were recorded for all patients included in the study, focusing on details relevant to AAA risk stratification, including age at time of last visit to the clinic, personal history of vascular aneurysms, family history of AAA, smoking status, blood pressure, and diabetes status.[16] Additionally, number of visits to the clinic with a primary care provider within the study period was collected. Information on imaging type was collected, with delineation between imaging for the purposes of asymptomatic AAA screening, diagnostic imaging for suspected symptomatic AAA, and incidental imaging of the abdominal aorta for purposes unrelated to screening or suspicion of AAA. Incidental screening of the abdominal aorta was only included if it showed the entire abdominal aorta and the diagnostic report specifically commented on the aorta. Finally, charts were searched for evidence that AAA screening had been recommended, independent of screening completion.

Comparison of screening rates between time periods of interest was completed using the normal

approximation of the binomial distribution. To effectively compare rates, patients who had completed screening in an earlier time period were excluded from the analysis. Analysis of demographic characteristic effects on screening rates was completed with the Fisher exact test.

This study received approval from the Health Sciences Research Ethics Board of the Office of Human Research Ethics at Western University in London.

## Results

Initial identification of possible patients for chart review yielded 340 individuals with the appropriate sex and date of birth. Ultimately, 72 patients did not meet inclusion criteria, and 2 met exclusion criteria (**Figure 1**), leaving a total included population of 266.

Patient ages tended to be between 65 and 69 years of age (**Table 1**). All participants were of both male sex and male gender. Smoking status (ie, active and ex-smokers) was determined based on the US Preventive Services Task Force recommendation cutoff of 100 cigarettes or equivalent ever smoked.[3] Family history of AAA included first-degree relatives only. Hypertension and diabetes diagnoses were determined if clearly documented in a patient's chart or if the patient was undergoing active therapy. Previous aneurysm history included any large-vessel aneurysm beside that of the abdominal aorta.

Of the 266 people included in the study, 110 patients either had previous imaging of their abdominal aorta or had screening recommended that was not completed. Of the 110 patients, 64 had an AAA screening test completed, 42 had incidental imaging of their abdominal aorta, and the remaining 4 had screening recommended that was not completed. Excluding the 106 individuals who had abdominal aortic imaging before the study period, 160 patients were then eligible for screening at the start of our study period, 6 months before the publication of the CTFPHC AAA guideline.

Of the 160 individuals, not all visited the clinic in both the 6 months before and the 6 months after the guideline publication; specifically, 48 individuals did not have a visit in both periods of study, with 24 not being seen in the first time period, and 24 not being seen in the second time period. The number of individuals still eligible for screening in each of these time periods who visited the clinic at least once, as well as the outcomes of those visits with respect to AAA screening, are detailed in **Table 2**. Individuals eligible for screening visited the clinic a cumulative total of 332 times in the 6 months before the CTFPHC AAA

**Figure 1.** Participant inclusion and exclusion flowchart

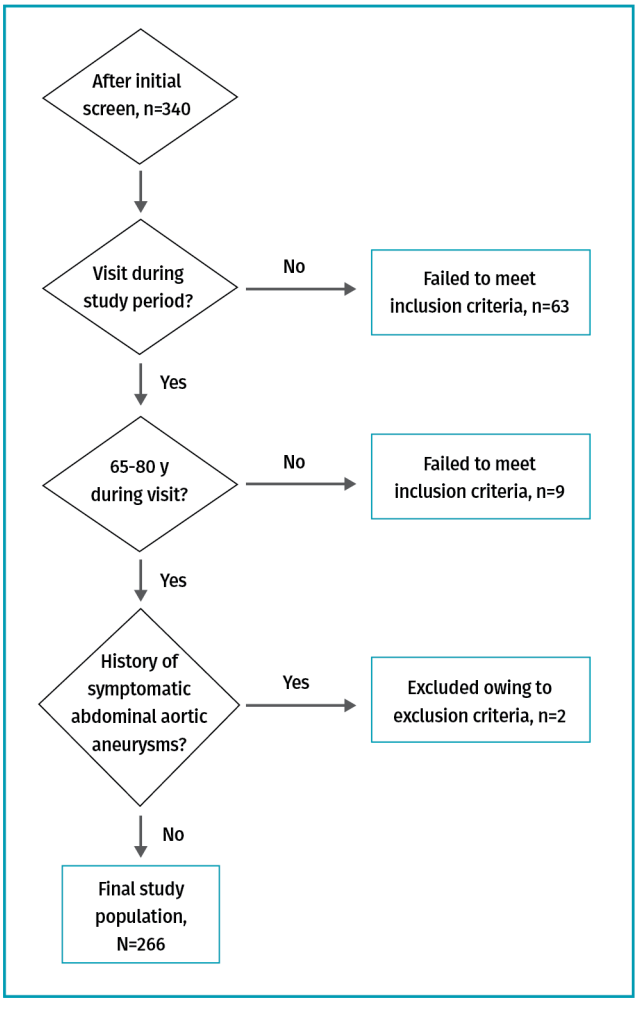


**Table 1.** Participant demographic characteristics: *N=266.*

| DEMOGRAPHIC CHARACTERISTIC | NO. OF PARTICIPANTS |
|---|---|
| Age at last visit, y | |
| • 65-69 | 120 |
| • 70-74 | 83 |
| • 75-80 | 63 |
| Smoking status | |
| • Non-smoker | 126 |
| • Ex-smoker | 105 |
| • Active smoker | 30 |
| • Unknown | 5 |
| Family history of AAA | |
| • Yes | 7 |
| • No | 259 |
| Hypertension | |
| • Yes | 165 |
| • No | 101 |
| Diabetes | |
| • Yes | 54 |
| • No | 212 |
| History of aneurysm (excluding AAA) | |
| • Yes | 2 |
| • No | 264 |

AAA—abdominal aortic aneurysm.

guideline compared with 340 visits in the 6 months after. This corresponds to an average (SD) of 2.44 (1.82) visits per eligible patient in the 6 months before and 2.66 (1.99) visits per eligible patient after.

Across all time periods, of the 266 patients included in the study, 136 had no imaging of their abdominal aorta for any reason, nor any documented discussion of AAA screening. Conversely, 69 individuals had AAA screening completed and a further 9 had a discussion of AAA screening without any imaging, for a total uptake rate of 88.5% (69 of 78) for those who had AAA screening recommended. Moreover, 49 individuals had incidental imaging of their abdominal aorta. As noted in **Table 2**, of the 266 patients in the study, the remaining 3 individuals not yet accounted for had abdominal aortic imaging for purposes related to the diagnosis or exclusion of an AAA within the study period, which was neither incidental nor for screening purposes. Therefore, the overall imaging rate was 48.9% (130 of 266). There was no statistically significant difference in screening rates between the 6 months after the CTFPHC AAA screening guidelines and the 6 months before ($P$=.337) among those still eligible for screening.

In terms of relevant demographic characteristics for risk stratification, a total of 7 individuals had a documented family history of AAA, of which 5 had imaging of their abdominal aorta performed, plus 1 additional individual who had screening recommended but not completed. This was not statistically significant relative to the study population as a whole ($P$=.0598), though the size of this subpopulation was too small to allow meaningful conclusions. Positive smoking status (active or ex-smoker) was more common, with 135 individuals having a relevant smoking history. Approximately half of these current and former smokers (68 individuals [50.4%]) had any sort of abdominal aortic imaging performed or recommended, which was not statistically significantly different compared with non-smokers (62 of 126 had imaging performed or recommended, 49.2%; $P$=.9016).

## Discussion

Changing physician practices in accordance with best available evidence is rarely a straightforward process. Even when guidelines are consistent and evidence is clear, resistance to change is prevalent, typically requiring active interventions to produce widespread practice changes.[17-21] With AAA screening, while guidelines across the world share similarities, there remain inconsistencies and the supporting evidence is not ironclad.[1-4] As such, the low overall rate of screening seen in this study is not surprising.[22] Having 68 individuals screened or recommended screening before the main study period was a surprise, and reflected inconsistent adherence to various pre-2017 guidelines by clinicians within the clinic. That there was no meaningful difference in AAA screening rates among smokers, despite far stronger evidence and consistent recommendations to do so in major guidelines, underlines the difficulties seen in converting evidence-based recommendations into everyday practice. By contrast, individuals having a family history were screened at a far higher rate, albeit in a small sample. From clinical experience, patient-driven factors are likely at play. Patients with a family history of AAA are more aware of the condition and its consequences. Thus, they may have been recommended by their relatives to have screening done.

Incidental imaging of the abdominal aorta appears to have a meaningful contribution to overall abdominal aortic imaging in a real-world setting. Before guidelines recommended AAA screening with ultrasound, incidental findings of AAAs were the primary method of detection.[23] Overall, 18.4% of individuals in this study (49 of 266) had undergone incidental imaging of their abdominal aorta. There is little reason to think these nonscreening tests would require repeat imaging with a dedicated screening examination, just as those who undergo diagnostic colonoscopy for any reason do not generally require separate, dedicated colon cancer screening. Reports on incidental findings of AAA on computed tomography scans and magnetic resonance imaging affirm that such findings are frequent.[24,25] Additionally, 1 study in a Canadian context indicated clinical benefit to following up on such incidental AAA findings.[26] Incidental abdominal aortic imaging therefore reduces the total pool of individuals requiring intentional AAA screening.

This study had an uptake rate after an AAA screening recommendation of 88.5%, higher than those in other studies, namely a United Kingdom study with a 78.1% uptake rate.[11] One possible explanation is that previous

**Table 2. Distribution of AAA screening by dates in relation to CTFPHC AAA screening guideline release on Sep 11, 2017**

| SCREENING DATE RANGE | INDIVIDUALS ELIGIBLE FOR SCREENING AND HAD ≥1 CLINIC VISITS | NO AAA IMAGING OR SCREENING DISCUSSION | INDIVIDUALS RECOMMENDED DIAGNOSTIC TESTS FOR AAA | INDIVIDUALS WHO HAD INCIDENTAL IMAGING OF THE ABDOMINAL AORTA | INDIVIDUALS WHO HAD AAA SCREENING RECOMMENDED OR COMPLETED | SCREENING RECOMMENDED OR COMPLETED, % (95% CI) |
|---|---|---|---|---|---|---|
| Mar 11, 2017, to Sep 11, 2017 | 136 | 123 | 2 | 4 | 7 | 5.15 (2.09-10.32) |
| Sep 12, 2017, to Mar 11, 2018 | 128 | 121 | 1 | 3 | 3 | 2.34 (0.49-6.70) |

AAA—abdominal aortic aneurysm, CTFPHC—Canadian Task Force on Preventive Health Care.

research focused on offering population-wide screening and detailed the uptake rate across the entire population. In this case, there may have been selectivity in who was offered screening in the first place, skewing results toward those more likely to complete screening. Furthermore, having the offer come through routine care from the patient's regular primary care team, rather than through a separate screening program, may have increased uptake.[11] Additional methods to increase uptake are worth exploring, including one such suggestion for point-of-care, office-based screening.[12]

## Limitations

This was a retrospective chart review of a single, academic family medicine centre involving an integrated team and, as such, may not be representative of family physician practices across the province or country. The period of analysis before and after the introduction of the CTFPHC AAA screening guidelines was relatively short due to external requirements of this study, and may therefore have failed to capture a later change in practice patterns.

## Future directions

Given the low overall rates of screening and challenges with adherence, further research is warranted to improve AAA screening rates, as guideline changes alone do not appear to result in rapid change in clinical practice.[27] Areas of interest worth exploring include electronic medical record–based reminders, nursing staff involvement in screening, dedicated screening programs via public health authorities, and point-of-care ultrasound screening in a primary care setting.[10-12,15,28-30]

## Conclusion

Approximately half of all individuals had imaging of their abdominal aorta in some form, although incidental imaging of the aorta made a sizeable contribution to this percentage. A previous history of smoking did not appear to affect screening or imaging rates, despite its well-established association with the risk of AAA development. In this limited setting and over the short time period, screening practices did not change appreciably with the introduction of the CTFPHC AAA screening guidelines.

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**Contributors**

**Dr Craig Olmstead** contributed to study design, data collection, data analysis, and final manuscript. **Adrienne T. Wakabayashi** contributed to study design, project logistics, and final manuscript. **Dr Thomas R. Freeman** contributed to the data analysis and final manuscript. **Dr Sonny S. Cejic** contributed to study design and final manuscript.

**Competing interests**

None declared

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