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Choosing wisely: The Canadian Thoracic Society's list of six things that physicians and patients should question

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ABSTRACT

Choosing Wisely is a campaign that aims to help clinicians and patients engage in conversations regarding unnecessary tests and treatments, in order to improve quality of care and reduce waste in healthcare. Specialty societies are asked to develop lists of commonly used tests and treatments that are not supported by evidence and/or could expose patients to unnecessary harm. The Canadian Thoracic Society appointed a 5-member Choosing Wisely Task Force to develop this list. After establishing evidence-based criteria for recommendation selection and prioritization, they generated an initial list of candidate recommendations from: 1) existing respiratory-related US and Canadian Choosing Wisely recommendations; 2) Canadian Medical Association (CMA) Patient-Oriented Evidence that Matters (POEMsTM) rated by $\geq 10\%$ of CMA respondents to: "... help to avoid unnecessary or inappropriate treatment, diagnostic procedures, preventative interventions or a referral..."; and 3) additional suggestions by CTS content experts. The list was serially reduced through voting by members of the Canadian Respiratory Guidelines Committee and the Task Force in three electronic Delphi processes and by members of the CTS in an online poll (members were also asked to suggest additional recommendations). Evidence reviews were performed for the top 10 recommendations. This resulted in the following CTS Choosing Wisely Top 6 List: 1) Don't initiate long-term maintenance inhalers in stable patients with suspected COPD if they have not had confirmation of post-bronchodilator airflow obstruction with spirometry; 2) Don't perform CT screening for lung cancer among patients at low risk for lung cancer; 3) Don't perform chest computed tomography (CT angiography) or ventilation-perfusion scanning to evaluate for possible pulmonary embolism in patients with a low clinical probability and negative results of a highly sensitive D-dimer assay; 4) Don't treat adult cough with antibiotics even if it lasts more than 1 week, unless bacterial pneumonia is suspected (mean viral cough duration is 18 days); 5) Don't initiate medications for asthma (e.g., inhalers, leukotriene receptor antagonists, or other) in patients ≥ 6 years old who have not had confirmation of reversible airflow limitation with spirometry, and in its absence, a positive methacholine or exercise challenge test, or sufficient peak expiratory flow variability; and 6) Don't use antibiotics for acute asthma exacerbations without clear signs of bacterial infection. This list was developed through a rigorous and novel process and addresses overuse in different areas of respiratory medicine in Canada. It can provide a starting point for a systematic implementation process targeting clinicians and patients, to the benefit of patients and the healthcare system in general.

RÉSUMÉ

Choisir avec soin est une campagne qui vise à aider les cliniciens et les patients à engager un dialogue sur les tests et les traitements non nécessaires, afin d'améliorer les soins et réduire la consommation inutile de ressources. Cette campagne consiste à demander à des sociétés de spécialité de dresser la liste des tests et des traitements communément utilisés qui ne sont pas soutenus par des données probantes ou qui pourraient occasionner des préjudices non nécessaires aux patients. La Société canadienne de thoracologie a mis sur pied un groupe de travail de cinq personnes pour dresser une telle liste dans le cadre de Choisir avec soin. Après avoir établi des critères fondés sur les données probantes pour la sélection des recommandations et leur priorisation, les membres du groupe de travail ont dressé une liste initiale de recommandations possibles en se fondant sur a) les recommandations Choisir avec soin existantes aux États Unis et au Canada en matière de problèmes respiratoires; 2) les données probantes axées sur le patient qui importent (POEMs^{MC}) de l'Association médicale canadienne pour lesquelles $\geq 10\%$ des répondants de l'AMC affirment qu'elles « ... contribuent à éviter les traitements, procédures de diagnostic, interventions préventives ou références non nécessaires ou inopportunes... »; et 3) les

KEYWORDS

Knowledge translation; Choosing Wisely; practice guideline; respirology; health care costs; cost-benefit analysis; quality improvement

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suggestions additionnelles émises par les experts en contenu de la STC. La liste a été écourtée suite au vote des membres du Groupe de travail et du Comité des lignes directrices en santé respiratoire du Canada dans le cadre de trois processus Delphi réalisés par voie électronique. Les membres de la STC ont eux aussi été appelés à répondre à un sondage en ligne (on leur a également demandé de suggérer des recommandations additionnelles). Les données probantes ont été examinées pour les 10 recommandations principales. Ce processus a donné lieu à la liste des six premières recommandations *Choosing Wisely* suivantes: 1) Ne commencez pas de traitement d'entretien à long terme par inhalateurs chez des patients cliniquement stables souffrant d'une MPOC présumée tant que l'obstruction respiratoire post-bronchodilatateur n'a pas été confirmée avec la spirométrie 2) Ne procédez pas au dépistage du cancer du poumon par TDM chez les patients exposés à un risque faible à l'égard de ce cancer 3) Ne demandez pas d'angiographie par TDM ou de scintigraphie pulmonaire de ventilation-perfusion pour évaluer la présence possible d'une embolie pulmonaire chez des patients pour qui la probabilité clinique d'un tel diagnostic est faible et qui ont des résultats négatifs à un test hautement sensible des D-dimères 4) Ne traitez pas la toux chez l'adulte au moyen d'antibiotiques même si elle dure depuis plus d'une semaine, à moins de soupçonner une pneumonie bactérienne (la durée moyenne d'une toux d'origine virale est de 18 jours); 5) Ne commencez pas de médicaments pour l'asthme (p. ex., inhalateurs, antagonistes des récepteurs des leucotriènes ou autres) chez les patients ≥ 6 ans, chez qui on n'a pas confirmé d'obstruction respiratoire réversible avec la spirométrie, ou, en l'absence d'une telle confirmation, un résultat positif au test de provocation à la méthacholine ou à l'effort, ou une variabilité suffisante de leur débit expiratoire de pointe; et 6) N'utilisez pas d'antibiotiques pour les crises d'asthme en l'absence de signes clairs d'infection bactérienne. Cette liste a été élaborée par le biais d'un processus rigoureux et novateur et se veut une réponse à l'utilisation superflue dans différents domaines de la médecine respiratoire au Canada. Elle peut constituer un point de départ pour la mise en œuvre d'un processus systématique visant les cliniciens et les patients, au profit des patients et du système de santé en général.

Introduction

Health research is a constantly expanding global enterprise resulting in an ever-growing body of medical knowledge that continually updates our understanding of diseases, diagnostic tests, and therapies; introduces new tests and therapies; and renders prior approaches out-of-date. With over seventy-five clinical trials and 11 systematic reviews published daily,¹ it is not surprising that clinicians often struggle to filter, prioritize, and ultimately, to integrate new knowledge into practice. As a result, large, population-based studies have demonstrated that 30% to 45% of patients do not receive best evidence-based care.^{2,3} The science of knowledge translation attempts to address these gaps in order to realize the full potential of medical science for the benefit of human health.

Typically, knowledge translation seeks to bridge the gap between what we “ought to do” and “what we do.” However, not only are patients missing out on required care, but there is also evidence that patients receive care that is *not* required. In the U.S., it is estimated that 20% to 30% of patients receive contraindicated and potentially harmful care.^{2,3} Correspondingly, up to one third of health care costs could be saved without compromising care quality.^{4,5} In a recent Canadian report, 30% of tests, treatments and procedures across a variety of care practices were found to be potentially unnecessary, equating to more than one million occurrences of unnecessary care every year.⁶

It is this compelling gap between what we “ought *not* to do” and “what we do” that has given rise to the *Choosing Wisely* movement: “a campaign to help clinicians and patients engage in conversations about unnecessary tests and treatments and make smart and effective choices to ensure high-quality care.”⁷ The American Board of Internal Medicine Foundation (ABIM) established the *Choosing Wisely* Campaign in 2012,⁸ and the Canadian Medical Association partnered with physician leaders

to form *Choosing Wisely* Canada (CWC) in 2014 (<http://www.choosingwiselycanada.org/>).⁹ The campaign calls for specialty societies to develop “Top 5” lists of commonly used tests and treatments that are not supported by evidence and/or could expose patients to unnecessary harm. To date, over 45 Canadian specialty societies have proposed more than 230 recommendations.

The Canadian Thoracic Society (CTS) has produced its first *Choosing Wisely* list for respiratory medicine. Our development process and its results are presented herein.

Methods

The CTS established the *Choosing Wisely* Task Force (“Task Force”) in November, 2015, led by the Vice-Chair of the Canadian Respiratory Guidelines Committee (SG) and consisting of 5 members (4 respirologists, 1 nurse/PhD scientist—this statement’s authors) selected for their expertise in knowledge translation, health system management, and quality improvement; content expertise across a broad range of areas in pulmonary medicine; and wide geographic representation (4 cities across Alberta, Saskatchewan and Ontario).

The Task Force (“we”) established a methodology (shown in the following sections and [Figure 1](#)) based on a narrative review of *Choosing Wisely* processes reported by other international societies.

Criteria for recommendation selection and prioritization

We first established criteria for recommendation selection and prioritization in each step of the process. We adapted an existing framework developed on the basis of evidentiary rationales identified in a review of 25 societies’ *Choosing Wisely* lists¹⁰

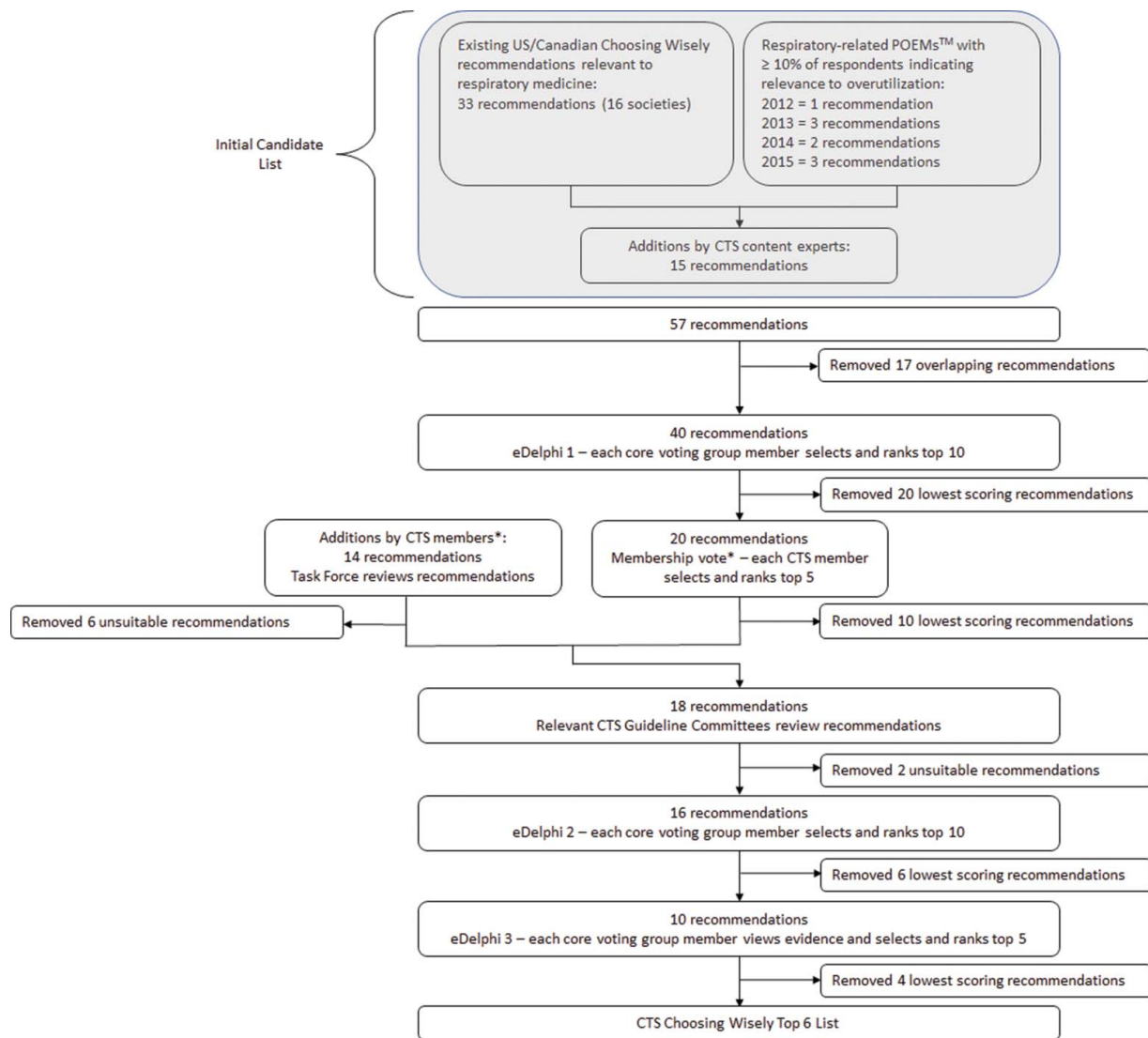


Figure 1. Results of each stage of the recommendation selection and voting process. We provided a list of pre-established criteria for recommendation selection and prioritization at each step of the process. We included voting results from prior rounds in each eDelphi process. The core voting group consisted of members of the Canadian Respiratory Guidelines Committee (comprised of the chair of each CTS guideline committee) and Choosing Wisely Task Force (19 total members). * We received responses from 158/625 (25.3%) CTS members. CTS denotes Canadian Thoracic Society.

and considered criteria used by other societies^{11–13} and guidance provided by Choosing Wisely Canada.

Development of initial candidate list

Next, we developed a list of candidate recommendations from multiple sources. First, we reviewed all existing U.S. and Canadian Choosing Wisely recommendations and included those that were relevant to respiratory medicine. Next, we supplemented this with relevant evidence from POEMsTM (Patient-Oriented Evidence that Matters) rated with the information assessment method (IAM) between 2012 and 2015. POEMs are brief summaries of new studies that impact practice, sent to participating Canadian Medical Association members on each weekday. Members are invited to rate the information in the POEM through the IAM questionnaire, in exchange for continuing professional development credits. The IAM is a validated 4-question self-assessment questionnaire¹⁴ that includes the following

selection: “This information will help to avoid unnecessary or inappropriate treatment, diagnostic procedures, preventative interventions or a referral, for this patient.” We identified any POEM for which $\geq 10\%$ of respondents made this selection,¹⁴ and included any that we deemed relevant to respiratory medicine. For each of these, we formulated a Choosing Wisely recommendation statement. We then sent this consolidated list to members of the Task Force, CTS executive, and each CTS guideline committee (total 120 CTS content experts) and solicited suggestions for additional recommendations. Lastly, we removed overlapping recommendations.

Voting stages

- 1) eDelphi 1: in the first stage of an electronic Delphi process, we sent the list of 40 candidate recommendations to our core voting group, consisting of members of the Canadian Respiratory Guidelines Committee (comprised of the chair

of each CTS guideline committee) and the Task Force (total 19 members). Each user was asked to select and rank the top 10 recommendations. Using a scoring method which assigned a single point for selection and a graduated number of points depending on selection order, we identified the top 20 recommendations.

- 2) Membership input: we then invited the entire CTS membership to provide input through an electronic questionnaire (through a link embedded in an email request). Members were presented with the top 20 list from the prior round and asked to select and rank the top 5 recommendations. We also solicited suggestions for additional recommendations.

Using the same scoring method, we selected the top 10 of 20 recommendations. We also evaluated newly suggested additions, consulted with content experts in the CTS where required, included any that were deemed valid and congruent with our selection and prioritization criteria, and refined wording where required.

- 3) eDelphi 2: in the second stage of the electronic Delphi process, we sent a list of the top 10 recommendations and relevant newly suggested additions to our core voting group (along with rank scores from prior voting rounds) and asked each user to select and rank the top 10 recommendations. At this stage, we also sent any content-appropriate recommendations to each corresponding CTS guideline writing committee to ensure alignment with previous and upcoming CTS guidelines. After this, the remaining top 10 scoring recommendations underwent final wording modifications by relevant CTS guideline committees and Choosing Wisely Canada.

Table 2. Top 10 recommendations (reached after the second stage of the electronic Delphi process) (rankings from each stage provided in brackets).

1. Don't initiate long-term maintenance inhalers in stable patients with suspected COPD if they have not had confirmation of post-bronchodilator airflow obstruction with spirometry
eDelphi 1: (2/40); Membership input: (1/20); eDelphi 2: (1/16).
2. Don't perform CT screening for lung cancer among patients at low risk for lung cancer. eDelphi 1: (11/40); Membership input: (3/20); eDelphi 2: (2/16).
3. Don't initiate medications for asthma (e.g. inhalers, leukotriene receptor antagonists, or other) in patients ≥ 6 years old who have not had confirmation of reversible airflow limitation with spirometry, and in its absence, a positive methacholine or exercise challenge test, or sufficient peak expiratory flow variability.
eDelphi 1: (1/40); Membership input: (2/20); eDelphi 2: (3/16).
4. Don't perform chest computed tomography (CT angiography) or ventilation-perfusion scanning to evaluate for possible pulmonary embolism in patients with a low clinical probability and negative results of a highly sensitive D-dimer assay.
eDelphi 1: (9/40); Membership input: (4/20); eDelphi 2: (4/16).
5. Don't perform computed tomography (CT) surveillance for evaluation of indeterminate pulmonary nodules at more frequent intervals or for a longer period of time than recommended by established guidelines.
eDelphi 1: (6/40); Membership input: (6/20); eDelphi 2: (5/16).
6. Don't treat adult cough with antibiotics even if it lasts more than 1 week, unless bacterial pneumonia is suspected (mean viral cough duration is 18 days).
eDelphi 1: (4/40); Membership input: (5/20); eDelphi 2: (6/16).
7. Don't prescribe combination therapy with an inhaled corticosteroid and long-acting beta agonist as initial therapy in mild to moderate asthma before a trial of inhaled corticosteroids alone.
eDelphi 1: (5/40); Membership input: (8/20); eDelphi 2: (7/16).
8. Don't perform routine PET scans in the work-up of patients with nonsmall cell lung cancer who have CT scan evidence of metastatic disease and who are not being considered for surgical resection.
eDelphi 1: (16/40); Membership input: (10/20); eDelphi 2: (8/16).
9. Don't perform full polysomnography to diagnose obstructive sleep apnea in adult patients with high pretest probability who do not have concomitant cardiopulmonary comorbidities or comorbid sleep disorders (instead, consider home sleep apnea testing in these patients as part of a comprehensive care plan).
eDelphi 1: (7/40); Membership input: (9/20); eDelphi 2: (9/16).
10. Don't use antibiotics for acute asthma exacerbations without clear signs of bacterial infection.
eDelphi 1: N/A; Membership input: N/A (added by a CTS member at this stage); eDelphi 2: (10/16).

Note. eDelphi denotes electronic Delphi process.

Table 1. Criteria used for selection and prioritization of candidate CTS choosing wisely recommendations (in priority order).

1. The risk/cost-benefit ratio suggests that the practice should be reduced, because it:
 - is not supported by evidence to be equal or superior to alternative(s); or
 - has comparable benefit to alternative(s) but at a higher risk (physical or mental, including patient stress), higher cost, or both; or
 - is marginally more beneficial than alternative(s) but does not warrant the magnitude of increased risk and/or cost; or
 - has benefit, lower risk, and/or lower cost when used, but is being underused (in this case, the waste is the failure to perform that practice).
2. Evidence base: evidence supporting insufficient efficacy and/or safety of the low-value practice (versus alternatives) is strong, or evidence for benefit does not exist.
3. The practice is common.
4. The practice is modifiable by individual physicians (i.e. the change is within the control of individual physicians).
5. Practice falls within the domain of practices performed by respirologists.
6. Harm above cost: if two or more candidate practices are similarly matched on the aforementioned criteria, prioritize practices that cause harm over those that incur unnecessary cost.
7. Broad relevance: if two or more candidate practices are similarly matched on the aforementioned criteria, prioritize practices that are relevant to practice across the country, as opposed to only in certain regions.
8. Ease of measurement: if two or more candidate practices are similarly matched on the aforementioned criteria, prioritize practices for which adherence to the recommendation can be measured.

We then performed a narrative review of evidence supporting these top 10 recommendations (each member of the 5-member Task Force addressed 2 recommendations). Members produced summaries of evidence based on (in priority order): existence of a similar prior Choosing Wisely recommendation(s); evidence-based guideline recommendations (especially Canadian guidelines, where applicable); systematic reviews; and individual studies. We found limited evidence for 2 of the 10 recommendations, and therefore engaged the Canadian Agency for Drugs and Technologies in Health (CADTH) to perform a rapid evidence review for each of these.

- 4) eDelphi 3: in the last stage of the electronic Delphi process, we sent the top 10 recommendations along with their evidence summaries (and rank scores from prior voting rounds) to our core voting group and asked each user to select and rank the top 5 recommendations. Applying the same scoring method, we decided to include the top 6 recommendations in our final list, given

the proximity in scores between the 5th and 6th scoring recommendations.

Approval of recommendations

The final Top 6 list was approved by the CTS Executive. With guidance from the lead, Task Force members then produced accompanying paragraphs explaining the rationale for each recommendation, along with pertinent references. These summaries underwent slight wording modifications by Choosing Wisely Canada and were vetted by all Choosing Wisely professional society leads across Canada before finalization and translation (for translated recommendations, see the online supplement or the Choosing Wisely Canada website: <http://www.choisiravecsoin.org/recommendations/>).

Results

The final criteria for recommendation selection/prioritization that were presented to voting members are found in Table 1. Results of each stage of the selection and voting process are presented in Figure 1. Of 625 CTS members, 158 (25.3%) responded (at the “membership input” stage). The top 10 recommendations (after the second stage of the electronic Delphi process), along with their rank order in each prior stage are presented in Table 2.

The following are the final Top 6 CTS Choosing Wisely Recommendations, including the original source of each recommendation, rationale summaries, and key references.

1. Don't initiate long-term maintenance inhalers in stable patients with suspected COPD if they have not had confirmation of post-bronchodilator airflow obstruction with spirometry (Original source: CTS content experts).

A diagnosis of COPD should be considered in any patient who has dyspnea, chronic cough, and/or sputum production and an appropriate history of exposure to noxious stimuli. However, not all patients with these symptoms have COPD and spirometry demonstrating a post-bronchodilator forced expiratory volume in one second to forced vital capacity (FEV1/FVC) ratio < 70% (or less than the lower limit of normal, if available) is required to make a definitive diagnosis. Starting maintenance inhalers without first objectively diagnosing COPD results in unnecessary treatment in those patients who do not actually have the disease. In turn, this exposes these patients to both the side-effects and the cost of these medications, and might delay the appropriate diagnosis.^{15–17}

2. Don't perform CT screening for lung cancer among patients at low risk for lung cancer. [Original source: 2013 American Thoracic Society/American College of Chest Physicians (ATS/ACCP) Choosing Wisely list].

CT scan screening has no proven benefit in patients who are not at high risk for lung cancer, regardless of age, smoking history or other risk factors. Low dose chest CT screening has been found to reduce lung cancer mortality in a well-defined population of patients at high risk for lung cancer, defined by age 55–74, at least a 30-pack

year history of tobacco use, and smoking within the last 15 years. However, screening is also associated with several harms, including false-negative and false-positive results, incidental findings, overdiagnosis (detecting indolent and clinically insignificant tumors that would not have been detected in the patient's lifetime without screening), and cumulative exposure to radiation (which can cause cancer). Screening also leads to unnecessary anxiety and invasive procedures, which carry their own complications. Accordingly, it should not be used in patients who do not meet these strict criteria nor in patients with a health problem that substantially limits life expectancy or the ability or willingness to have curative therapy.^{18–22}

3. Don't perform chest computed tomography (CT angiography) or ventilation-perfusion scanning to evaluate for possible pulmonary embolism in patients with a low clinical probability and negative results of a highly sensitive D-dimer assay (Original source: 2013 ATS/ACCP and 2014 American College of Emergency Physicians Choosing Wisely lists).

The majority of adults with chest pain and/or dyspnea do not have a pulmonary embolism (PE). There is strong evidence that in patients with low pre-test probability as determined by a clinical prediction rule (e.g. Wells score), a negative highly sensitive D-dimer assay effectively excludes clinically important PE. Furthermore, there are potential harms to performing CT pulmonary angiography (CTPA) or ventilation-perfusion (V/Q) scanning, including exposure to ionizing radiation, adverse events due to the administration of intravenous contrast, and identification of clinically insignificant PE leading to inappropriate anticoagulation. However, physicians should exercise clinical judgement in populations in whom this two-step algorithm has not been validated (e.g. pregnant patients).^{23–26}

4. Don't treat adult cough with antibiotics even if it lasts more than 1 week, unless bacterial pneumonia is suspected (mean viral cough duration is 18 days) (Original source: Canadian Medical Association POEM™).²⁷

The majority of adults with a short duration of cough from an acute respiratory tract infection have a viral rather than a bacterial infection. Patients often underestimate the typical cough duration from an infectious illness, and when cough does not resolve within their expected time frame, may request antibiotics. The average duration of cough (not treated with antibiotics) is around 18 days, though patients only expect to cough for 5 to 7 days. Use of immediate or delayed antibiotics does not change clinical outcomes compared to no antibiotics in these situations. On the other hand, the harms of over-prescribing antibiotics include medication costs, adverse reactions, and the possibility of inducing bacterial resistance to antibiotics. Physicians should educate patients about the expected duration of cough and the consequences of inappropriate antibiotic use in acute respiratory tract infections.^{27–31}

5. Don't initiate medications for asthma (e.g. inhalers, leukotriene receptor antagonists, or other) in patients ≥ 6

years old who have not had confirmation of reversible airflow limitation with spirometry, and in its absence, a positive methacholine or exercise challenge test, or sufficient peak expiratory flow variability (Original source: CTS content experts).

Although international guidelines uniformly recommend objective testing to establish an asthma diagnosis, this diagnosis is often made clinically and asthma medications are often initiated on that clinical basis. However, findings on physical exam and symptoms such as cough, wheeze, and/or dyspnea can be caused by other conditions. As a result, up to one third of patients who have been diagnosed with asthma do not have evidence of asthma when objectively tested with pulmonary function tests. A false clinical diagnosis of asthma may delay diagnosis of the actual underlying condition, which may include serious cardiorespiratory conditions. Furthermore, patients with a false diagnosis of asthma who are started on asthma medications are unnecessarily exposed to both the side-effects and the costs of these medications. It should be noted, however, that this recommendation may not be applicable in patients who cannot reproducibly undergo objective testing for asthma (including children less than 6 years old) and in settings where such testing is not available.^{32–35}

6. Don't use antibiotics for acute asthma exacerbations without clear signs of bacterial infection (Original source: CTS membership).

Asthma exacerbations are characterized by decreased expiratory airflow as well as increased shortness of breath, cough, wheezing, chest tightness, or a combination of these symptoms. When such an attack is precipitated by an infection, it is much more likely to be viral than bacterial. The role of bacterial infection is often overestimated; however antibiotics should be reserved for relatively rare cases in which there is strong evidence of a bacterial infection, such as pneumonia or bacterial sinusitis. Potential harms of unnecessary antibiotic treatment include medication costs, side-effects (including a risk of allergy), and emergence of bacterial resistance.^{34,36–39}

Discussion

In healthcare, as in life, more does not always mean better. Unnecessary tests and treatments not only expose patients to direct harm, but also to indirect harm from downstream investigations and anxiety resulting from false positives. Moreover, as fiscal constraints increasingly threaten our ability to deliver timely best practice in the care of all Canadians, we can no longer ignore the fact that if we inadvertently waste system resources on one patient, we contribute to delaying or denying another patient's needed care.

We believe that our CTS Choosing Wisely list presents an opportunity for respiratory physicians to take the lead in attempting to address this dilemma, by engaging their patients in conversations about when certain types of care are necessary and when they are not. The goal is for physicians (whose decisions account for 80% of healthcare expenditures⁸) and patients

to drive reductions in harm and cost, thereby averting the need for unilateral actions by health system administrators.

Our Choosing Wisely list has several strengths. Firstly, we developed and executed a rigorous process that leveraged CTS content expertise and current literature, employed a multi-step Delphi process (featuring anonymous voting and serial feedback on previous voter rankings) and engaged the CTS membership. In particular, we built on previous work to establish a comprehensive list of criteria to guide selection and prioritization of recommendations which included emphasis on harm above cost, broad national relevance and measurability of adherence to the recommendation. In addition to previous societies' recommendations and expert input, we utilized IAM ratings to enable inclusion of relevant CMA POEMs in our initial candidate list. Given that about 250 POEMs are sent each year, and each engenders approximately 1000 IAMs ratings, our 2012–2015 analysis required us to consider over 1 million physician ratings in choosing candidate recommendations. This "big data" method allowed us to account for the preferences of thousands of physicians across the country, constituting a unique crowd-sourcing approach which has not previously been employed in Choosing Wisely lists.¹⁴ Also, although a minority of previous societies have reached out to their memberships in the Choosing Wisely process, we believe that this step enhanced the quality, representativeness, and diversity of our recommendations, and will enable the widespread buy-in that will now be required for successful implementation. We also note that although there were considerable differences between recommendation rankings by the core voting group in the first electronic Delphi process and by CTS members in the ensuing vote, these differences were much smaller in the second electronic Delphi process (Table 2). This suggests that provision of prior rounds' voting results had its intended effect, influencing core voting group members to consider broader CTS member preferences.

The diversity in the sources of our recommendations reflects the success of this process, with each contributing source represented in the final list. Two recommendations were derived from prior societies' lists, two were proposed by CTS content experts, one was derived from a CMA POEM and another was proposed by a CTS member at large. Similarly, our recommendations span diverse common conditions within respiratory medicine: chronic obstructive pulmonary disease (COPD), lung cancer, venous thromboembolism, cough and asthma.

Our process does have some noteworthy limitations. The Choosing Wisely model calls for a small list of priority recommendations that can enable concentrated implementation efforts. This inevitably leads to exclusion of certain important topic areas. Although not found in the Top 6 list, recommendations addressing sleep medicine and pulmonary nodule management were present in the top 10 and should certainly be considered by clinicians practicing in these areas. We also note that recommendations 1 and 5 both call for increased use of spirometry (for COPD and asthma, respectively), which is fundamentally a call for implementation rather than de-implementation.¹⁰ However, in both cases, a strong case is made for

considerable waste and possible harm due to *underuse* of spirometry. In fact, it may be feasible to design a single spirometry implementation strategy to address both recommendations. However, we note that spirometry underuse is a gap that has been described in primary care⁴⁰ and is less likely to be a major gap in specialty respiratory care (given that access to testing is not a barrier). Accordingly, these recommendations do not align with the selection and prioritization criterion that specified that recommendations should pertain to practices performed by respirologists. A formal scoring and weighting of selection and prioritization criteria may have helped to ensure alignment with these criteria, and should be considered in future processes. We also note that not all recommendations are relevant to pediatric pulmonary medicine, and it may be beneficial to develop a separate pediatric list. Similarly, certain highly appropriate but regionally specific recommendations were excluded due to lack of national applicability, and future processes might include an option to generate regional sub-lists. Our 25% membership response rate was not as high as that reported by some previous societies,⁴¹ and face-to-face member engagement at our national conference, and/or promotion by our provincial associations should be considered to drive participation. Finally, inclusion of patients in this process would help to ensure relevance and public buy-in, and methods to achieve this,⁴¹ along with partnerships with relevant patient organizations should be considered.

The much larger challenge lies ahead, in the implementation of these recommendations. This will require a shift from the conventional implementation science paradigm to one of “de-implementation” (also called “de-adoption” or “disinvestment”).⁴² In a recent scoping review, authors did not identify a single study involving de-implementation in respiratory medicine.⁴² Identifying 13 published frameworks to guide the de-implementation process, they developed a common model which mimics the well-established Knowledge-to-Action Cycle.⁴³ Research is now required to document the magnitude of the gaps surrounding each of our recommendations, the expected gains in patient and patient-reported outcomes and health economic impacts from eliminating each practice and the barriers to and enablers of each required behaviour change.

Measurement strategies can be based on an existing integrated framework to assess the impact of Choosing Wisely interventions, emphasizing a need to measure patient-reported experiences and outcomes alongside provider attitudes, knowledge, and behavior.⁴⁴ Strategies to assess unintended consequences, such as decreased use of high-value care or increased use of low-value alternatives⁴⁴ should also be included. The most effective previous Choosing Wisely campaigns have focused on areas with high baseline rates of overuse (i.e. large care gaps) and which lead to poor outcomes (i.e. which cause harm, as opposed to just cost more), and have tailored interventions to physician and patient behavior change barriers.⁴⁴ The most successful interventions have featured changes to policies – particularly the funding provided for low-value practices.⁴²

Choosing Wisely Canada works with implementation partners in Alberta, Manitoba, and Ontario, provides implementation toolkits from “early-adopters,” and engages with medical students across Canada. Importantly, it promotes

recommendations directly to patients through print and social media, encouraging patients to initiate these conversations with their physicians (a promising strategy called patient-mediated knowledge translation).⁴⁵ These are exciting implementation opportunities which the CTS should now try to leverage for our Top 6 list. More broadly, it will be important to include implementation of this list in the same Dissemination, Implementation, and Evaluation Framework that we have developed for all CTS guidelines.⁴⁶ We also note that this list must remain dynamic, as these gaps may be filled and new gaps and priorities will arise. Accordingly, we hope to repeat this process at regular intervals.

Although we acknowledge that, like guideline recommendations, our Choosing Wisely recommendations will not be applicable in every clinical situation, we believe that they provide a much-needed starting point for discussions with our fellow respiratory physicians, our patients, and our provincial health authorities. We hope that this list will benefit patients directly, and ultimately, indirectly, by increasing efficiencies in our healthcare system.

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Declaration of interest

The authors report no conflict of interest.

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