Clinical Biochemistry 49 (2016) 4–7

Contents lists available at ScienceDirect

Clinical Biochemistry

journal homepage: www.elsevier.com/locate/clinbiochem

Clinical

# Canadian family physician knowledge and attitudes toward laboratory utilization management

Amy Thommasen [a], Fiona Clement [b], David W. Kinniburgh [c], Cheryl K. Lau [d], Maggie Guo [d], Jeannine Viczko [d], Kelly Guggisberg [a], Roger E. Thomas [e], Tanvir Chowdhury Turin [e], James C. Wesenberg [f], Amid Abdullah [a], William S. Hnydyk [g], Christopher Naugler [a,e,*]

[a] Department of Pathology and Laboratory Medicine, Cumming School of Medicine, University of Calgary, 3535 Research Rd NW, Calgary, Alberta T2L 2K8, Canada
[b] Department of Community Health Sciences, Faculty of Medicine, University of Calgary, 3280 Hospital Drive NW, Calgary, Alberta T2N 4Z6, Canada
[c] Alberta Centre for Toxicology, University of Calgary, HM B19, 3330 Hospital Drive NW, Calgary, Alberta T2N 4N1, Canada
[d] Alberta Health Services Provincial Lab Utilization Office, 3535 Research Rd NW, Calgary, Alberta T2L 2K8, Canada
[e] Department of Family Medicine, Cumming School of Medicine, University of Calgary, Health Sciences Centre, 3330 Hospital Drive NW, Calgary, Alberta T2N 4N1, Canada
[f] Red Deer Regional Hospital Centre, Clinical Laboratory, 3942 50A Avenue, Red Deer, Alberta T4N 4E7, Canada
[g] Alberta Medical Association, 12230 106 Ave NW, Edmonton, Alberta, T5N 3Z1, Canada

ARTICLE INFO

*Article history:*
Received 18 August 2015
Received in revised form 22 September 2015
Accepted 23 September 2015
Available online 26 September 2015

*Keywords:*
Alberta
Cost savings
Family practice
Laboratories
Quality improvement

ABSTRACT

**Objectives:** Mitigation of unnecessary and redundant laboratory testing is an important quality assurance priority for laboratories and represents an opportunity for cost savings in the health care system. Family physicians represent the largest utilizers of laboratory testing by a large margin. Engagement of family physicians is therefore key to any laboratory utilization management initiatives. Despite this, family physicians have been largely excluded from the planning and implementation of such initiatives. Our purposes were to (1) assess the importance of lab management issues to family physicians, and (2) attempt to define the types of initiatives most acceptable to family physicians.

**Design and methods:** We invited all Alberta family practice residents and practicing physicians to participate in a self-administered online electronic survey. Survey questions addressed the perceived importance of lab misutilization, prevalence of various types of misutilization, acceptability of specific approaches to quality control, and responsibility of various parties to address this issue.

**Results:** Of 162 respondents, 95% considered lab misutilization to be either important or very important. Many physicians placed the responsibility for addressing lab misutilization issues on multiple parties, including patients, but most commonly the ordering physician (97%). Acceptability for common strategies for quality improvement in lab misutilization showed a wide range (35%–98%).

**Conclusions:** These responses could serve as a framework for laboratories to begin discussions on this important topic with primary care groups.



## 1. Introduction

Laboratory testing (chemistry, hematology, microbiology and pathology test requests) is the highest volume procedure in medicine and often estimated to drive at least 70% of downstream medical decisions [1]. However, many laboratory tests are ordered inappropriately. Zhi et al. performed a meta-analysis of the current literature on inappropriate laboratory testing practices and reported that overutilization accounted for an average of 20.6% of lab tests [2]. Unpublished results from our research group show that in Calgary unnecessary repeat testing accounts for almost an additional 20% of test requests. This widespread misutilization of laboratory tests leads to medical mistakes, missed therapeutic opportunities, misdirected clinical effort, and ultimately misuse of public funds.

Despite the gravity of the situation, laboratory utilization management initiatives generally struggle to show even a 10% reduction in testing. For example, Feldman et al. found that cost display on laboratory order forms resulted in a 9.1% decrease in the number of tests ordered [3]. Giguere et al. noted that printed educational materials have a performance improvement of 4.3% [4]. Van Walraven et al. found that removing a common laboratory test (TSH-Thyroid Stimulating Hormone) from the requisition form resulted in a 12% decrease in its use [5]. Feedback and brief education reminder messages elicited a 10% reduction in testing [6]. Finally, a test frequency restriction of HbA1C testing within a 90-day period only led to a moderate decrease

* Corresponding author at: Department of Pathology and Laboratory Medicine, Cumming School of Medicine, University of Calgary, 3535 Research Rd NW, Calgary, Alberta T2L 2K8, Canada.
*E-mail address:* Christopher.Naugler@cls.ab.ca (C. Naugler).

http://dx.doi.org/10.1016/j.clinbiochem.2015.09.010
0009-9120/

of 8% [7]. There is undoubtedly an element of publication bias in the reported successful interventions. Our experience in Calgary is that utilization interventions more commonly result in reductions of 4–5%. Moreover, any improvements that are made are often short-lived. The paradigm of "top-down" management strategies by laboratories or health system administrators has not proven effective or durable.

Unfortunately there has been remarkably little engagement of clinical stakeholders in the planning of strategies. As the largest group of physicians, family doctors are responsible for over 55% of all laboratory expenditures [8]. No broad-scale initiatives will succeed without engagement of this group. Ironically, family physicians have been largely shut out of the planning of utilization management. In this study we will generate background information on:

1. Which utilization management initiatives are acceptable to family physicians?
2. What is the current state of knowledge on laboratory test misutilization among family physicians in Alberta?

## 2. Methods

In 2014 we invited family physicians throughout the province of Alberta, Canada to participate in a self-administered electronic survey conducted through the online program Survey Monkey. An invitation to participate was distributed by the Alberta Medical Association in their monthly newsletter. Respondents were informed that responses would remain anonymous and consent was implied by completion of the survey. All data was kept only on a secure Alberta Health Services server. Surveys were approved by the University of Calgary Conjoint Health and Research Ethics Review Board. The survey consisted of 8 questions that required approximately 5 min to complete (see supplemental material for a copy of the survey). Questions addressed attitudes and knowledge of (1) importance of lab test misutilization, (2) percentage of all lab tests corresponding to common types of lab misutilization, (3) cost per test of common lab tests (electrolyte panel, vitamin D, and antinuclear antibodies (ANA)), (4) responsible parties to address lab utilization issues, (5) acceptable approaches to quality improvement, (6) demographic data including rural vs. urban and stage of career, (7) desire to participate in lab utilization work-shop and (8) further comments. Respondents were provided with a 5 pt. scale (very unimportant to very important) to answer attitudinal questions. The survey was closed on February 20, 2014 at which time the preliminary results were presented in a lab utilization working group.

## 3. Statistical analysis

Continuous variables such as cost per test and estimated percentage of mis-ordered tests were summarized by using the mean and standard deviation. The remaining variables were tabulated by category, and percentages were reported. All complete data on each question were used; questions that were left blank were removed from analysis. Tests for differences between resident vs. practicing physicians as well as within practicing physicians (rural versus urban and <5 years versus >5 years of practice) were conducted on all questions. We used *t*-tests for continuous responses and $\chi 2$ tests of association for categorical responses. Statistical analysis was performed with Microsoft Excel 2007 software.

## 4. Results

We received 162 responses to the survey. Questions that were unanswered were removed from data analysis. The characteristics of the respondents are provided (Table 1). The majority of physicians surveyed practiced in an urban setting with over 5 years of experience.

Of the respondents, 95% agreed that laboratory test overuse is either important or very important (Fig. 1). Respondents felt that lab tests are mis-ordered frequently. Over-ordering of lab tests was perceived as a more common occurrence then under-ordering (Fig. 2). Individual perceptions of the frequency of various types of misutilization varied widely with a range between 50% and 95%. The cost estimate by all respondents was highest for ANA ($73), followed by vitamin D ($66) and electrolyte panel ($25) and ranged widely for each test (Fig. 3).

Only three results varied significantly between physician groups ($p > 0.05$). The proportion of all lab tests that were "not ordered when clinically indicated" varied significantly between both physicians in practice greater than 5 years (16% of all lab tests) versus physicians with less than 5 years experience (11% of all lab tests) ($p = 0.001$) and rural (11% of all lab tests) versus urban physicians (16% of all lab tests) ($p = 0.016$). Also, residents felt the cost of electrolytes (CAD$15.30 per test) was significantly less than staff physicians (CAD$26.02 per test) ($p = 0.034$).

The respondents placed the responsibility to address laboratory utilization issues on multiple groups (Table 2). The vast majority of Alberta family doctors (96.8%) place the responsibility of addressing lab utilization issues on individual medical doctors followed by diagnostic laboratories (79.4%). It is interesting to note that over half of the respondents (58.7%) felt that patients had a responsibility to address this issue. All initiatives to improve the quality of testing were acceptable to greater than 35.9% of physicians (Table 3). Continuing education was the most widely accepted (98.1%) followed by audit and feedback of test ordering practices to individual physicians (84.6%).

A variety of comments were elicited from respondents which fell into broad categories of education/audit and feedback, restriction of tests, cost display, private clinics, patient pay, and electronic medical

**Table 1**
Characteristics of family physicians that responded to the current lab utilization survey and comparison to the 2014 National Physicians Survey[*€] [9,10].

| Characteristics | Respondents from current study | Respondents from National Physicians Survey |
|---|---|---|
| Resident | 21/157 (13%) | 11% |
| Practicing MD | 133/157 (84%) | 89% |
| *Practice setting*[+] | | |
| Rural | 25/133 (19%) | 23% |
| Urban | 108/133 (81%) | 74.3% |
| *Experience level*[+] | | |
| ≤5 years | 29/133 (22%) | – |
| >5 years | 104/133 (78%) | – |
| Retired MD | 0/157 (0%) | – |
| Administrative physician | 0/157 (0%) | – |
| Other[*] | 3/157 (2%) | – |

[*] Data provided as number/total and number (percentage) of respondents.
[€] Skipped questions were excluded from ratios and percentages.
[+] Data for practicing physicians only.

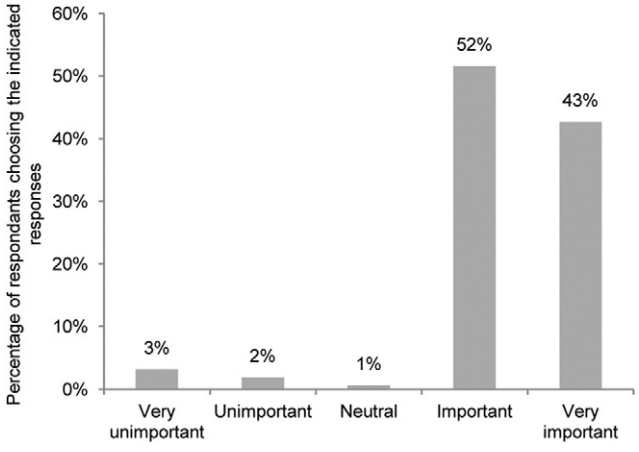


**Fig. 1.** Perceived importance of lab overuse by family physicians.

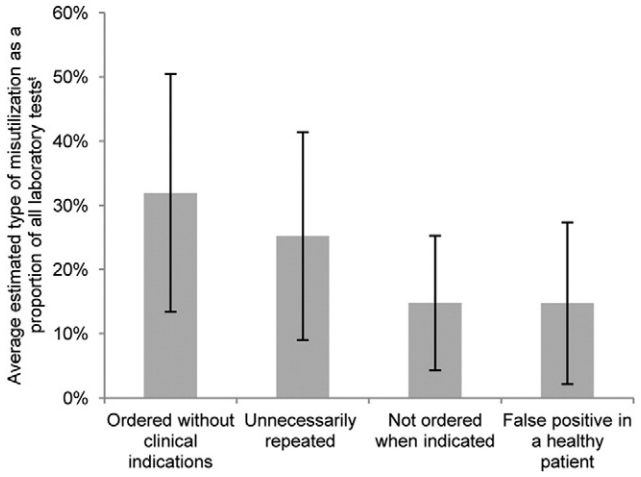


**Fig. 2.** Summary of Alberta family physicians perceptions of various types of lab testing practices as a percentage of all tests ordered. ‡Error bars indicate standard deviation.

records (see supplemental material). A recurring recommendation was to target specific groups of physicians that commonly over-utilize tests such as new physicians and non-MD healthcare providers.

## 5. Discussion

Family physician engagement is key to the success of any laboratory utilization management strategy. Through an electronic survey of family physicians, we learned that most sampled family physicians in Alberta consider misutilization of laboratory testing to be an important issue and perceive that both laboratory over and underutilization are occurring at high rates.

Family physician's estimated costs for electrolytes and ANA (CAD$25 and CAD$73, respectively) were very close to the prices given by the Government of Alberta's Schedule of Medical Benefits (SOMB), which lists electrolytes for CAD$24.08 and ANA for CAD$62.69 [11]. The cost of Vitamin D testing was not listed on the SOMB but was estimated to be CAD$35. All reference prices include both pre-analytic and analytic costs. The high standard deviation in responses indicates that marked heterogeneity exists; however, physicians as a group had an accurate understanding of lab costs.

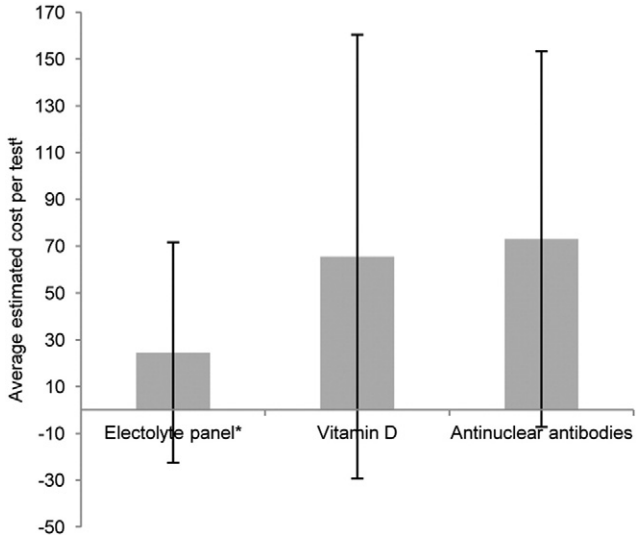


**Fig. 3.** Physician perception of test cost for three common lab tests. ‡Error bars indicate standard deviation. *The electrolyte panel consists of serum sodium, potassium, chloride, and $CO_2$.

**Table 2**
Family physician perceptions of the responsibility of various groups to address lab utilization issues (total of 155 responses).

| Answer option | Percent response (%) | Response count (n) |
|---|---|---|
| Individual medical doctors (MDs) | 96.8 | 150 |
| Diagnostic laboratories | 79.4 | 123 |
| Provincial government (Alberta Health Services) | 71.6 | 111 |
| Alberta Medical Association (AMA) | 67.7 | 105 |
| Patients | 58.7 | 91 |
| Other | 11.0 | 17 |

The most popular initiatives with family physicians are continued education and audit and feedback techniques. Unfortunately, the effectiveness of both of these techniques within the literature is weak. A 2013 Cochrane review suggested an absolute risk difference of 2% across various outcomes; however the quality of data was low [4]. A recent meta-analysis by our research group (unpublished) shows that audit and feedback techniques have only a modest effect and 14/22 of identified studies failed to reach significance. Larger effects are often seen with the other techniques, which we found acceptable to fewer (50.6% to 57.1%) surveyed physicians, including removing certain tests from requisitions, user pay for certain tests, and restricting test frequency of certain tests. For example, effect sizes of up to 96% where found in an Ontario study following removal total thyroxin testing from provincial health plan funding [12]. Many respondents within our study suggested targeting specific physicians groups that have shown overutilization may improve outcomes. In a prospective controlled trial, Bunting and Van Walraven showed an 8% reduction in test utilization following an education and feedback program given to a group of the highest ordering physicians in a Canadian community setting [13].

A low number of responses were collected relative to an estimated total of 4500 family practice residents and practicing physicians in Alberta [9]. Therefore, the survey results may not be representative. The Dillman Total Survey Design Method or similar method was not employed because we did not have access to the email address for all Alberta physicians [14]. A partial distribution to Alberta physicians using the email addresses in our possession would have resulted in a biased sample composed of an increased proportion of physicians known to the authors and academic physicians. Therefore, an advertisement to complete the survey was placed in The Guardian, an official publication of the Alberta Medical Association. The proportions of demographic information was similar between our respondents and the National Physician's Survey, a large government administered survey of including analysis of Alberta Family Physicians, which has a response rate of approximately 18% (Table 1) [9,10].

**Table 3**
Family physician acceptability of various approaches to improving the quality of laboratory testing (total of 156 responses).

| Answer option | Percent response (%) | Response count (n) |
|---|---|---|
| Continuing education | 98.1 | 153 |
| Audit and feedback of test ordering practices to individual physicians | 84.6 | 132 |
| Restricting the test frequency of certain tests | 57.1 | 89 |
| Modifying the format of test requisition forms (i.e. Removal of certain tests) | 51.3 | 80 |
| User pay for certain tests | 50.6 | 79 |
| Specialized test requisition forms for certain tests | 44.9 | 70 |
| Restricting certain tests to specific specialist groups | 38.5 | 60 |
| Pathologist approval required for certain tests | 36.5 | 57 |
| Positive incentives ("gain-sharing") for changes in test ordering practices | 35.9 | 56 |

This study showed that surveyed family physicians value efforts from themselves, lab physicians, governing organization, and the patients themselves to curb lab misutilization. This information could serve as a framework for laboratories to begin discussions on this important topic with family physician groups. The initiatives moving forward should be addressed through collaborative research between primary care and laboratory researchers.

## Author contributions

CN conceived the study and co-drafted that article. AT contributed to analysis and interpretation and co-drafted that article. FC, DWK, CKL, MG, JV, KG, RET, TCT, JCW, AA and WSH contributed to the analysis and interpretation of data and revised the paper for important intellectual content. CKL additionally designed the survey and collected responses. All authors gave final approval of the version to be published and agree to act as guarantor of the work.

## Acknowledgments

The authors thank the Alberta Medical Association for advertising the survey to its members.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.clinbiochem.2015.09.010.

## References

[1] M.J. Hallworth, The '70% claim': what is the evidence? Ann. Clin. Biochem. 48 (2011) 487–488.
[2] M. Zhi, et al., The landscape of inappropriate laboratory testing: a 15-year meta-analysis, PLoS One 8 (11) (2013), e78962.
[3] L.S. Feldman, et al., Impact of providing fee data on laboratory test ordering, JAMA Int. Med. 173 (10) (2013) 903–908.
[4] A. Giguère, et al., Printed educational materials: effects on professional practice and healthcare outcomes (review), Cochrane database of systematic reviews, 10 2013, pp. 1–199.
[5] C. Van Walraven, M. Raymond, Population-based study of repeat laboratory testing, Clin. Chem. 49 (12) (2003) 1997–2005.
[6] R.E. Thomas, et al., Effect of enhanced feedback and brief educational reminder messages on laboratory test requesting in primary care: a cluster randomised trial, Lancet 367 (9527) (2006) 1990–1996.
[7] I. Sadek, Successful test utilization management initiatives in a Canadian centre, Can. J. Pathol. 4 (4) (2012) 108–109.
[8] C. Naugler, et al., Yearly clinical laboratory test expenditures for different medical specialties in a major Canadian city, Am. J. Clin. Pathol. 144 (1) (2015) 97–102.
[9] The College of Family Physicians of Canada, C.M.A., The Royal College of Physicians and Surgeons of Canada, 2014 National Physician Survey. 2014 March 16, 2015 Available from: http://nationalphysiciansurvey.ca/surveys/.
[10] The College of Family Physicians of Canada, C.M.A., The Royal College of Physicians and Surgeons of Canada, National Physician Survey. 2012 Accessed March 16, 2012 Available from: http://nationalphysiciansurvey.ca/surveys/.
[11] Alberta health care insurence medical procedure list as of 01 October, 2014 Available from: http://www.health.alberta.ca/professionals/SOMB.html.
[12] C. Van Walraven, V. Goel, B. Chan, Effect of population-based interventions on laboratory utilization: a time-series analysis, JAMA 280 (23) (1998) 2028–2033.
[13] P.S. Bunting, C. van Walraven, Effect of a controlled feedback intervention on laboratory test ordering by community physicians, Clin. Chem. 50 (2) (2004) 321–326.
[14] S.N. Hoddinott, M.J. Bass, The Diliman total design survey method: a sure-fire way to get high survey return rates, Can. Fam. Physician 32 (1986) 2366–2368.