

Treating the right patient at the right time: Access to cardiac catheterization, percutaneous coronary intervention and cardiac surgery

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The Canadian Cardiovascular Society Access to Care Working Group was formed with a mandate to use the best science and information available to establish reasonable triage categories and safe wait times for common cardiovascular services and procedures through a series of commentaries. The present commentary discusses the rationale for access benchmarks for cardiac catheterization and revascularization procedures for patients with stable angina, and access benchmarks for cardiac catheterization and surgery for patients with valvular heart disease. Literature on standards of care, wait times and wait list management was reviewed. A survey of cardiac centres in Canada was performed to develop an inventory of current practices in identifying and triaging patients. The Working Group recommends the following medically acceptable wait times for access to cardiac catheterization: 14 days for symptomatic aortic stenosis and six weeks for patients with stable angina and other valvular disease. For percutaneous coronary intervention in stable patients with high-risk anatomy, immediate revascularization or a wait time of 14 days is recommended; six weeks is recommended for all other patients. The target for bypass surgery in those with high-risk anatomy or valve surgery in patients with symptomatic aortic stenosis is 14 days; for all others, the target is six weeks. All stakeholders must affirm the appropriateness of these standards and work continuously to achieve them. There is an ongoing need to continually reassess current risk stratification methods to limit adverse events in patients on waiting lists and assist clinicians in triaging patients for invasive therapies.

Key Words: *Access to care; Angiography; Angioplasty; Bypass; Valve surgery; Wait times*

The Canadian Cardiovascular Society (CCS) is the national professional society for cardiovascular specialists and researchers in Canada. Currently, national standards or targets for access to care for cardiovascular procedures or office consultations do not exist. While some provinces have established targets for some cardiovascular procedures, to date there has not been a national consensus on wait time targets, issues of regional disparities or even on how to quantify the problem.

The CCS Council formed an Access to Care Working Group ('Working Group') in the spring of 2004 to use the best

Traiter le bon patient au bon moment : L'accès au cathétérisme cardiaque, à l'intervention coronaire percutanée et à la chirurgie cardiaque

Le mandat du groupe de travail d'accès aux soins de la Société canadienne de cardiologie est d'utiliser les données scientifiques et l'information les plus probantes pour établir des catégories de triage raisonnables et des temps d'attente sécuritaires afin d'obtenir des interventions et des services courants en santé cardiovasculaire, au moyen d'une série de commentaires. Le présent commentaire porte sur le principe d'établir des points de référence pour l'accès au cathétérisme cardiaque et aux interventions de revascularisation chez les patients atteints d'angine stable, de même qu'au cathétérisme cardiaque et aux interventions chirurgicales chez ceux qui souffrent d'une cardiopathie valvulaire. On a analysé les publications sur les normes de soins, les temps d'attente et la gestion des listes d'attente. On a aussi effectué un sondage auprès des centres de cardiologie du Canada pour mettre sur pied un inventaire des pratiques courantes en vue de repérer et de trier les patients. Le groupe de travail recommande les temps d'attente médicalement acceptables suivants pour accéder à un cathétérisme cardiaque : 14 jours en cas de sténose aortique symptomatique et six semaines pour les patients atteints d'angine stable ou d'une autre maladie valvulaire. Pour ce qui est de l'intervention coronaire percutanée chez les patients stables dont l'anatomie les rend très vulnérables, une revascularisation immédiate ou un temps d'attente de 14 jours est recommandé; cette attente peut passer à six semaines pour tous les autres patients. Le temps d'attente avant de subir un pontage chez les patients dont l'anatomie les rend très vulnérables ou avant de subir une chirurgie valvulaire chez ceux qui souffrent de sténose aortique symptomatique est de 14 jours, tandis que tous les autres patients peuvent attendre jusqu'à six semaines. Tous les intervenants doivent préconiser la pertinence de ces normes et toujours travailler pour les respecter. Il est nécessaire de réévaluer constamment les méthodes actuelles de stratification des risques pour limiter les événements indésirables chez les patients sur les listes d'attente et pour aider les cliniciens à procéder au triage des patients en prévision de thérapies efficaces.

science and information in establishing reasonable triage categories and safe wait times for access to common cardiovascular services and procedures. The Working Group elected to start the process with a series of commentaries. Each commentary is intended to be a first step in the development of national targets. The commentaries summarize the current variability of standards and wait times across Canada, where this information is available. They also summarize currently available data, particularly focusing on the relationship between the risk of adverse events as a function of wait time, as well as on the

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identification of gaps in existing data. Using best evidence and expert consensus, each commentary takes an initial position on what the optimal target for access to care should be for the cardiovascular service or procedure based on clinically determined risk to the patient without the intervention. The commentaries also call on cardiovascular researchers to fill the gaps in this body of knowledge and to further validate safe wait times for patients at varying degrees of risk.

The objective of the present commentary is to examine wait times for cardiac catheterization and revascularization procedures for patients with stable angina, and wait times for cardiac catheterization and cardiac surgery for patients with valvular heart disease.

CARDIAC CATHETERIZATION PROCEDURE RATES IN CANADA

Data from a Canada-wide survey of all cardiac catheterization facilities (1) revealed that between 1997 and 2002, catheterization rates have increased in all provinces. Nova Scotia and Alberta have the highest crude (unadjusted) cardiac catheterization rates (555.2 and 553.2 per 100,000, respectively), while Ontario had the greatest increase in rate over this five-year period (from 338.9 to 509.6 per 100,000). While there is some speculation that an ideal cardiac catheterization rate exists, we actually know very little about what this rate could be. The Cardiac Care Network of Ontario, in their Consensus Panel on Target Setting (2004), projected an appropriate catheterization rate of 623 per 100,000 in 2005, rising to 728 per 100,000 in 2008 (2). An important purpose of cardiac catheterization is to identify patients with severe coronary artery disease in whom a survival advantage has been demonstrated with revascularization procedures. One potential way to search for an optimal rate is to determine whether there is a population rate of cardiac catheterization beyond which the yield of high-risk anatomy does not rise. Using a detailed clinical registry that captures all patients undergoing cardiac catheterization in Alberta (Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease [APPROACH]), annual population rates of cardiac catheterization and the corresponding yield of high-risk anatomy cases in each of Alberta's 17 health regions for eight separate years (1995 to 2002) were calculated. For both sexes, increased regional rates for cardiac catheterization were linearly associated with an increasing yield of high-risk coronary anatomy, with no evidence of a plateau in yield when more procedures were performed. One additional high-risk patient would be identified for every 2.5 additional cardiac catheterization procedures in men and for every 3.7 additional procedures in women, suggesting that Alberta's population rates of 638.1 per 100,000 men and 314.1 per 100,000 women are too low to optimally detect high-risk individuals. Given that Alberta is a 'high rate' province (in terms of utilization of cardiac catheterization), these findings have potential national implications for target setting for cardiac catheterization and subsequent revascularization procedures (3).

ACCESS TO CARDIAC CATHETERIZATION FOR PATIENTS WITH STABLE ANGINA

Most of the increase in cardiac catheterization rates seen in Canada over the past few years relates to the acceptance of the use of early cardiac catheterization for patients with acute coronary syndromes. A full discussion of access to care for this important group of patients can be found in a separate

commentary (4). For patients with stable angina, the event rate appears to be very low over time (5-7). However, even for this stable group of patients, there are risks associated with queuing for cardiac catheterization, although most reports of adverse events are physician estimates or small retrospective studies (8-13). In a systematic prospective assessment of a central cardiac catheterization wait list registry in Hamilton, Ontario, Natarajan et al (14) found that major adverse cardiac events occurred in 1.6% of outpatients who waited a median of 60 days for the procedure. Predictors of adverse events included age and ejection fraction of less than 35%, and one-half of these events occurred within 35 days of referral.

ACCESS TO PERCUTANEOUS CORONARY INTERVENTION

From 1997 to 2002, data from the same survey of catheterization facilities (1) revealed that percutaneous coronary intervention (PCI) rates increased in all provinces except Newfoundland. The overall rates were highest in Quebec (155.5 per 100,000) and Alberta (150.6 per 100,000), with Prince Edward Island (94.6 per 100,000) and Ontario (85.6 per 100,000) having the lowest rates. The actual practice of PCI also varies greatly from province to province. For example, in Alberta and Quebec, close to 90% of PCI procedures are performed on an ad hoc basis, regardless of patient urgency. Therefore, the wait time for PCI is actually that of cardiac catheterization. Procedures that are deferred or staged multivessel interventions are generally booked within one to two weeks. In contrast, in Nova Scotia, PCI is evaluated much the same as potential coronary artery bypass graft surgery (CABG) patients, with performance on an exercise stress test providing the cut-off point for wait times. Urgent patients capable of less than 2 metabolic equivalents or those with exercise-induced hypotension wait two weeks. Those who can achieve between 2 and 5 metabolic equivalents wait two to four weeks. All other patients are considered elective and have a wait time of between four and six weeks. In Ontario, approximately 56% of PCI procedures are done on an ad hoc basis; however, many catheterization facilities in Ontario do not offer PCI procedures, and scheduled PCI is the norm rather than the exception in these cases, with a median wait time of less than 30 days for outpatients (2).

Few data are available that thoroughly assess the risks of adverse cardiac events while awaiting elective PCI procedures. Chester et al (15) described an event rate of 17% in 180 patients with stable angina, with a median wait time of eight months. Bengston et al (16) found that the risk of death or acute myocardial infarction was highest in older patients, those with diabetes mellitus and those with a lower ejection fraction. There are also data suggesting that intervention on chronic total occlusions is less successful with an interval wait time of more than 12 weeks (17). However, these studies were conducted in the era of less aggressive medical therapy and therefore may not reflect current event rates. Contemporaneous data are sadly lacking and should therefore be a focus of research attention.

Obviously, ad hoc PCI and scheduled procedures each have their advantages and disadvantages. Ad hoc procedures provide 'one-stop shopping' with one vascular access and no additional wait time. However, diagnostic angiograms may be cancelled due to long procedures, and there is heavy use of overtime pay for staff. Scheduled procedures provide the

advantage of ensuring that all necessary equipment is available and allow for the smooth flow of other cases through the catheterization laboratory, but they require an additional waiting period and a second vascular access. PCI rates themselves are in a state of flux, as drug-eluting stent technology impacts the ability to perform more complex coronary interventions. Each centre's unique approach to providing both type of revascularization and subsequent access to PCI must be taken into consideration when developing triage categories and maximum acceptable wait times for stable outpatients.

ACCESS TO CABG

The significant variation in procedure rates across Canadian provinces and health regions, while potentially reflecting differences in the relative health of the populations in these regions, is likely also related to regional and provincial differences in practice patterns and funding. Although PCI rates have increased over time, a corresponding increase in the rates of CABG procedures has not been seen, and provinces with high PCI rates tend to have lower CABG rates (1). Second only to Nova Scotia, Ontario has the next highest CABG rate in Canada. However, CABG rates in all provinces are approximately 30% lower than surgical volumes in the United States, particularly in the elderly. It is possible that perceived excessive wait times for surgery in the past have led to increased utilization of PCI (2). Indeed, surgical volumes have remained largely flat since 2000. It is difficult to predict whether this slowing of CABG growth volumes will continue, accelerate or be overwhelmed by the population at risk for coronary artery disease.

The issue of management of patients waiting for cardiac surgery, specifically CABG, has received considerable public, government and research attention.

In a universally accessible, publicly funded system with limited resources, a wait list is necessary for efficient use of those resources; it is not, in itself, a sign of problems, nor does it necessarily lead to suboptimal outcomes. Complete elimination of a surgical wait list would be exceedingly expensive and inefficient, and it would not necessarily be associated with improved results. However, for a wait list to not be detrimental to individual patients' outcomes, a number of principles must be adhered to:

1. Triage categories must be determined based on the risk of wait to an individual patient, based on the best available science.
2. Once triaged to a specific category, a patient's care should be provided on a 'first come, first served' basis. Discretionary queue reassignment should not occur.
3. Because most triaging systems rely heavily on patient-reported symptoms, there must be ongoing monitoring of patients on the wait list and recategorizing of those whose symptoms have changed.
4. The wait list management system and current wait times must be transparent and visible to the medical profession and the public. Both referring sources and patients should be informed if the preferred surgeon's wait time is longer than that of other available surgeons, so the patient can make an informed decision on the choice of surgeon.

5. The length of wait times must be monitored so that appropriate adjustments can be made in capacity. In many jurisdictions, CABG volume is reasonably stable, allowing for the provision of consistent annual funding and human resource planning. This also accommodates slower periods, such as during summer months. Thus, patients will not significantly be disadvantaged by the time of year when they present.

Notwithstanding the above principles, it is important to appreciate that an efficient use of resources dictates that the weekly surgical 'mix' of cases includes patients from all triage categories, not just the most ill or urgent. This ensures that the system does not develop bottlenecks in intensive care or long-term care facilities, which may occur if only very ill patients underwent surgery, and ensures that patients waiting at home are moving up the queue.

There is a considerable amount of literature describing the risk factors associated with adverse events while waiting for CABG. Complications are noted to occur fairly early in the waiting period, usually within acceptable institutional wait times (18-20). Indeed, in a report of over 5800 patients awaiting CABG in Sweden, Rexius et al (21) noted that the risk of death on the wait list increases significantly with time (11% per month). Risk scores have therefore become an important tool in patient assessment and queuing for cardiac surgery.

Each region in Canada has its own system for wait list management. In some cases, it has been standardized across an entire province due to the single-centre provision of services (Nova Scotia) or the development of a province-wide program (Ontario). As with PCI, each region needs to develop (and in many cases has developed) their own system that suits their particular circumstances.

The most highly developed and best known risk stratification system for patients awaiting CABG is the Cardiac Care Network's Urgency Rating Score (URS), which has been in existence since 1990. It stratifies patients into one of four categories to determine the recommended maximum wait time. The URS was developed by a consensus panel of cardiovascular experts, including community and academic cardiologists and surgeons, using the available literature and their clinical judgment to determine seven factors (CCS class, extent of coronary disease, ejection fraction, ischemic risk as determined by noninvasive testing, comorbidities, recent myocardial infarction and previous CABG) that most strongly influence the need for surgery and the risk of waiting (2). Nova Scotia uses a similar system although it relies more heavily on the results of functional testing to categorize patients waiting for surgery into one of four categories (18). Alberta has adopted the Ontario URS calculator, but has chosen to have only three categories for nonemergent surgery. The Réseau québécois de cardiologie tertiaire (Quebec Tertiary Cardiac Network) has designed a prioritization system based on functional class and noninvasive testing, with a maximum wait time of three months (22). While these and other scoring systems allow for careful triage of patients, they have not been shown to eliminate wait list mortality or morbidity (18). Additionally, some investigators have found difficulties with the Ontario URS and the many other scores that have been developed (23,24). This is a major focus of research, and the refinement of existing scores and development of new risk stratification methods are ongoing (25).

TABLE 1
Canadian Cardiovascular Society Access to Care Working Group's suggested targets for cardiac catheterization (cath) and revascularization for patients with stable angina or valvular heart disease

| | Cath target | PCI target | Surgery target |
|--------------------------------|-------------|-------------------------|----------------|
| Stable angina | 6 weeks | | |
| High-risk anatomy | | Immediate or 14 days | 14 days |
| All others | | 6 weeks | 6 weeks |
| Symptomatic aortic stenosis | 14 days | N/A | 14 days |
| All other valvular | 6 weeks | N/A | 6 weeks |

N/A Not applicable; PCI Percutaneous coronary intervention

While most investigators have noted that postoperative outcomes are not influenced by wait times (18,21), poorer health-related quality of life, with decreased social and physical functioning before and after surgery, has been described in patients waiting longer than three months for CABG (26). In addition, some data suggest that the actual size of the wait list and the number of emergency operations that occur in the week during which a patient is first referred influence individual delay for surgery (27), suggesting new areas of opportunity to improve resource planning.

ACCESS TO CARDIAC CATHETERIZATION AND CARDIAC SURGERY FOR PATIENTS WITH VALVULAR DISEASE

There are relatively little data on the risk of waiting for patients with valvular heart disease. Certainly, acute lesions with hemodynamic compromise, such as endocarditis, acute aortic insufficiency due to aortic dissection or acute mitral insufficiency due to papillary muscle infarction, are considered urgent and are dealt with appropriately. In patients with stable valvular lesions, the major risks are attributed to those with symptomatic aortic stenosis. Natarajan et al (14) identified this lesion as an independent predictor of adverse events while awaiting outpatient cardiac catheterization. Investigators have also identified aortic valvular disease as a predictor of adverse events while on a wait list for cardiac surgery (21), and data from Ontario suggest that patients waiting for valve surgery are at significantly higher risk of death than those waiting for isolated CABG (28). New triaging guidelines for safer queuing of patients with valvular disease are required, and indeed, aortic disease is now being incorporated into newly proposed risk scores (25).

WORKING GROUP RECOMMENDATIONS FOR MEDICALLY ACCEPTABLE WAIT TIMES FOR ACCESS

The Working Group advocates the development of national standards for formal risk stratification and timely access to diagnostic cardiac catheterization, revascularization procedures and valve surgery. Each jurisdiction would have to develop provincial, territorial or regional management plans for patients with stable angina or valvular heart disease. These should be supported and endorsed by providers, institutional or health authority administrations and boards, and

by provincial and territorial ministries of health. Adherence to these standards should be regularly reported to those responsible for delivery of care, as well as to the general public, as a report card.

A summary of recommended access targets is presented in Table 1. Patients with stable angina and stable valvular disease, other than symptomatic aortic stenosis, should undergo cardiac catheterization within six weeks. Patients who subsequently require scheduled PCI should wait no longer than six weeks for this additional procedure. Those with stable angina but with high-risk anatomy identified at the time of cardiac catheterization should have ad hoc PCI if facilities for this are available, or wait no longer than 14 days. Because of the identified risk for patients with symptomatic aortic stenosis, cardiac catheterization should be performed within 14 days.

The recommendations for cardiac surgery are predicated on the concept that a six-month waiting list (provided it is not growing) requires the same resources to manage the weekly surgical volume as does a six-week wait. Once a list is reduced to six weeks, the throughput remains the same. It is also more resource-efficient to have a shorter waiting timeframe because there would be fewer emergency room visits and admissions for patients on the wait list. With the risk of adverse events reduced, there is no need for very complex triage systems. Therefore, patients with stable angina should undergo CABG within six weeks. Those with high-risk anatomy identified at the time of catheterization should have a maximum wait time of 14 days. An acceptable wait time for valve surgery is six weeks, again, with the exception of patients with symptomatic aortic stenosis, who should undergo surgery within 14 days.

CONCLUSIONS

The public system must ensure that satisfactory resources are in place to deal with this important group of patients. All stakeholders involved in the care of these patients must affirm the appropriateness of these standards and work continuously to achieve them. A transparent access report card needs to be developed and reported publicly. It should include not only the ability to meet access standards, but also measures of referral rates from referring institutions or districts to ensure equitable access from these noninvasive centres.

The Working Group believes that the process of care and standards outlined above is a reasonable extrapolation of literature. There is an ongoing need to continually reassess current risk stratification methods to limit adverse events in patients on waiting lists and assist clinicians in triaging patients for invasive therapies. Nevertheless, we feel that these are reasonable national access targets to assure that most Canadians will receive the most appropriate care within the most appropriate timeframe.

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