

## REVIEW ARTICLE

# PRIORITIZING PATIENTS FOR ELECTIVE SURGERY: A SYSTEMATIC REVIEW

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**Background:** Priority scoring tools are mooted as means for dealing with burgeoning elective surgical waiting lists. There is ongoing development work in New Zealand, Canada and the UK. This emerging international perspective is invaluable in determining the application of these tools and addressing any pitfalls.

**Methods:** A systematic electronic literature review was performed. Information was also retrieved using a search of reference lists of all papers included in the review and contact with those who were involved in the development of such criteria.

**Results:** The ethical basis of prioritization differed among priority scoring tools and in a number was not stated. The majority of tools covered criteria for specific procedures. Delphi consensus methods and regression were the predominant methods for determining specific criteria. Authors' opinions were the main source of generic criteria. Linear and non-linear models or matrices summated criteria.

**Conclusion:** There is debate over the ethical basis for prioritization. It is a concern that it is not addressed in many studies. The development of generic criteria showed a dearth of consensus approaches that represents a significant gap in our knowledge. On the aspects of summation and weighting, the impact of assumptions on the prioritization of patients may not have been fully explored.

**Key words:** criteria, elective surgery procedures, priority, rationing, surgery, systematic review, waiting lists.

Abbreviation: CPAC, clinical priority access criteria.

## INTRODUCTION

The prioritization of patients for elective surgery is fast becoming a clinical reality. This is an international phenomenon that affects, among others, the UK,<sup>1</sup> Canada<sup>2</sup> and New Zealand.<sup>3</sup> It involves the use of priority scoring tools which are means to generate a score with which to prioritize the access of patients to elective surgical services. Whereas much early work has come from New Zealand, researchers in the UK are currently investigating a proposal to use patient health status measures to prioritize patients for outpatients and surgery (R. Kipping, unpubl. data, 2002) New Zealand type priority scoring tools are said to be 'breeding like rabbits' in the UK (R. Kipping, unpubl. data, 2002). A need exists therefore to give some guidance on their application be it in New Zealand or elsewhere.

The introduction of priority scoring tools in New Zealand occurred in conjunction with the health reforms of 1993 and subsequent years. Part of these reforms was to address the increasing burden of need with the express purpose of delineating services funded in the public system. The full implementation of the reforms is explained elsewhere.<sup>4</sup> A report, by Fraser *et al.* was commissioned to address the issue of waiting lists and suggest approaches to deal with the rationing of elective surgery.<sup>5</sup> They recommended the abolition of the system of patients waiting for

surgery having been assigned a category of urgent, semi-urgent or routine (waiting list system). In its place they envisaged a system that booked patients for surgery at the time of assessment (booking system). The aims of the booking system are to improve national equity of access, transparency of the process and patient certainty of services provided.<sup>2</sup>

To achieve these aims, patients were to be prioritized on the basis of predetermined criteria.<sup>5</sup> These were to become known as clinical priority access criteria (CPAC) and used to generate a score reflecting patients' priority. CPAC were introduced in 1997 as a prerequisite for funding and therefore in some cases were introduced without clinician consultation or discussion and without full validation.<sup>4</sup> Hence the CPAC were used as protocols for determining the priority score of a patient. It is now stressed that they are to fill the role of decision-making tools or decision aids.<sup>2</sup>

The implementation of the CPAC in New Zealand has crystallised a number of issues regarding prioritization which remain outstanding:

- (1) the ethical basis
- (2) the criteria to be used
- (3) the method used to give weight to and summate the criteria (the tool)
- (4) validation – internal (i.e. inter and intra-assessor) and external (i.e. impact on patient outcomes).

First, the ethical basis of the criteria included within CPAC is still debated. Criteria are based on patient urgency of need and their ability to benefit.<sup>5</sup> However, this fact has been criticized in a report by Evans and Price<sup>6</sup> that was commissioned by the Health Funding Authority arm of the Ministry of Health. Evans and Price considered the ethical principle of distributive justice, which is the concept of the distribution of scarce resources in a just manner. Based on this, the report stated that ability to benefit should not be a basis of prioritization.

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Second, specific criteria in New Zealand have been developed by literature review and consensus methods for some procedures (coronary artery bypass grafts, total hip joint replacement, transurethral resection of prostate, tympanostomy tubes, laparoscopic cholecystectomy).<sup>7,8</sup> However, other procedures including the majority of general surgery have only generic criteria. Within general surgery the development of these criteria has been sporadic. Hence multiple tools exist resulting in no nationally consistent CPAC.

Third, the tools used for the weighting and summation of criteria are inconsistent. Some of these have been mathematically flawed and force the distribution of patients' priority scores away from clinical judgement.<sup>9</sup> This contravenes the stated aim of CPAC, which is to assist clinical decision-making.

Finally, contrary to the recommendations of Fraser *et al.*<sup>5</sup> the CPAC have not yet been formally tested and evaluated. Dennett *et al.* investigated some of the tools at Auckland Hospital.<sup>9,10</sup> They found that there was no consistency between different tools and that in some cases the tools were not prioritizing patients with malignancies. Patient outcomes have been investigated using specific, but not generic, criteria and have been found wanting.<sup>11-14</sup> However, these have been predominantly in the area of coronary artery bypass graft surgery not in the arguably more imprecise area of general surgery.

The aim of the present review was to document the priority scoring tools for elective surgery reported to date. This emerging international perspective may thus shed some light on the issues that we have described above, and give some much-needed direction on priority scoring tool application. Specifically our objectives were to determine: the different ethical bases on which rationing/prioritization occurs, what different factors/criteria are in use, how criteria were derived and what different methods/tools of summation are in use.

## METHODS

### Search strategy

We sought to identify all literature that included novel criteria that were used to prioritize patients for elective surgery. An electronic search was performed of CINAHL (1982–2001), Current Contents (1993–2001), Pre-Medline and Medline (1966–2001), ABI/Inform (1971–2001) and Embase (1980–2001). Search terms included 'surgery', 'elective surgical procedures', 'operative surgical procedures', 'criteria', 'factors', 'decision', 'priority', 'rationing' and 'waiting lists'. No language restrictions were used. The reference lists of all papers included in the review were searched for additional papers. Contact was also made with individuals involved in the development or evaluation of such criteria to identify further papers. The review was not restricted to published or peer reviewed literature. No restriction was placed on the date of the study.

### Inclusion and exclusion criteria

Studies were included in the review if they met four criteria: (i) novel criteria/factors were a focus; (ii) they were used to prioritize or ration elective surgical procedures; (iii) the patients involved were adults; and (iv) the setting was a public health system/HMO. Any study design was of interest. We excluded papers concerning patients awaiting transplantation, criteria for appropriateness of surgery and papers that utilized criteria developed by others.

## Review

The review was descriptive and no statistical combination of results was undertaken. Two reviewers (ADM, WGC) independently selected studies for inclusion or exclusion. Disagreement was first resolved by discussion among the reviewers. If no consensus could be reached, the senior author (BRP) adjudicated. Data were extracted using a standardized pro forma and inserted into an electronic database. Data of interest were: the ethical framework, the purpose of the criteria (to ration or prioritize), the criteria used, how the criteria were derived, type of criteria (generic or specific), any waiting time recommendations, the tool developed (including weighting and summation method), special circumstances of the paper, and study design.

## RESULTS

### Search

The searches in CINAHL, Current Contents, Embase, ABI/Inform, and Premedline/Medline identified 38, 23, 19, 16 and 68 articles, respectively. Enquiries of other investigators produced three further articles. After exclusion of duplicates and examination of abstracts, 78 articles remained. After selecting those that met all the inclusion criteria including those from the manual search of references we were left with 41 papers (Table 1).

All studies identified criteria with which to prioritize patients for elective surgery. Six of them also stated rationing of health services as a purpose of the criteria.<sup>7-10,15,16</sup> It is pertinent to note that five of these six articles were reporting studies based in New Zealand. They were unhesitating in their use of the 'R' (rationing) word. This was in contrast to the more subtle inference in another from the UK to 'thresholds for treatment'.<sup>16</sup>

### Study design and methods

The studies were of varied design. Analytical design was used in 19 papers. There were 14 cohort studies, nine prospective<sup>9,10,15,17-22</sup> and five retrospective.<sup>14,23-26</sup> Three studies of case control design were undertaken.<sup>27-29</sup> Two further studies were clinical judgement analyses of the prioritization process.<sup>30,31</sup> Qualitative design was used in 15 papers. These include questionnaires of various stakeholders in the prioritization process,<sup>32-38</sup> interview and case note analysis,<sup>16</sup> Delphi consensus methods<sup>7,8,39-42</sup> and one letter as a comment on present systems.<sup>43</sup> There were a further seven theoretical papers concerning criteria and their summation.<sup>44-50</sup>

### Ethical basis

In order to categorize the ethical frameworks that were used for the prioritization of patients, we used the terms 'capacity to benefit' and 'urgency of need'. The category of ability to benefit included those frameworks that utilized a measure of the ability of the patients' need to be met by the procedure. Urgency of need was defined as those frameworks that considered temporal factors on the priority for surgery. Six of the papers used ability to benefit as the basis for prioritization.<sup>7,8,26,30,35,36</sup> One paper used a combination of ability to benefit and urgency of need.<sup>33</sup> Urgency of need was used by the majority of studies,<sup>14,17,19,22,25,27,28,34,38-41,43,45,47</sup> Three papers from Canada for cardiac surgery used a configuration of two nodes of questionable or contraindicated for surgery with the remainder prioritized on

**Table 1.** Criteria to prioritize patients for elective surgery

Reference no.	Ethical framework	Purpose	Criteria/factors	Weighting	Derivation of criteria	Specific or generic tool	Summation method	Waiting time recommended
7	Capacity to benefit, utilitarian	Prioritize and ration	Cataract: visual acuity, glare, ocular comorbidity, ability to work, visual function (extent of impairment), additional disability. Joint: pain, functional activity, movement and deformity, other factors (multiple joint disease, ability to work)	Visual acuity 40, glare 10, ocular ability to work 15, visual function 20, disability 5 Joint: pain 40, activity 20, functional movement 20, other 20	Literature summary, professional advisory groups, Delphi consensus, pilot lead to recalibrated weightings	Specific	Weighted additive linear model	No
8	Capacity to benefit, utilitarian	Prioritize and ration	Degree of coronary artery obstruction, angina class, exercise stress test, ability to work, age	Obstruction 36, angina 26, exercise test 22, ability to work 16	Literature meta analysis, advisory group, Delphi consensus, numerical weights assigned	Specific	Weighted additive linear model	No
9	Not stated	Prioritize and ration	Generic: suffering, disability, clinical cost of delay, degree of improvement anticipated, likelihood of improvement LAS: non-Specific (biliary pain): pain, severity, duration, history of acute cholecystitis, history of CBD stone, history of diabetes	Not stated	Generic: not stated Specific: consensus	Both	Generic – additive then multiplicative LAS-none specific–weighted additive linear model	No
10	Not stated	Prioritize and ration	Suffering, disability, clinical cost of delay, degree of improvement anticipated, likelihood of improvement	(Suffering 7 + disability 7 + CCD 6) × (degree of improvement 2 + likelihood 3)	Not stated	Generic	Additive and multiplicative	No
14	Urgency	Prioritize	Severity of angina, hypertension and previous CABG	Previous CABG 0.93, Increase BP 0.66, angina iii or iv 0.77	Logistic regression of predictors of composite end point of death, MI or readmission (confounded in that already prioritized)	Specific	N/A	No
15	Not stated	Prioritize and ration	Old: visual acuity, VA score, glare, clinical modifiers, visual impairment, impact on work/independence, other significant disability New: visual acuity score, glare, clinical modifiers, visual impairment, impact on work/independence, other disability	Old: see Hadorn New: not stated	Not stated but see Hadorn	Specific	Not stated see Hadorn	No

Table 1. Continued

Reference no.	Ethical framework	Purpose	Criteria/factors	Weighting	Derivation of criteria	Specific or generic tool	Summation method	Waiting time recommended
16	Unclear	Prioritize and ration	Visual acuity, handicap = impact on ADL, identification and assessment of other eye disease and general health which impact on ability to benefit	More weight on handicap but subjective	Semi-structured interviews of surgeons/ophthalmologists	Specific	N/A	No
17	Urgency	Prioritize	Coronary anatomy, symptom severity, functional status by stress testing (and ejection fraction <40% discretionary increase)	Not stated	Specific	Matrix of urgent	Yes	
18	Not stated	Prioritize	Visual acuity score, clinical modifiers = coexisting pathology, impact on ADL, additional disability, extent of visual impairment	40, 20, 10, 10, 20	'Asked' surgeons	Specific	Weighted additive linear model	No
19	Urgency	Prioritize	Length wait: psychosocial (need reassurance and less anxious wait less), pt decision to delay, wait list length, no health or visual criteria Factors associated with poor visual function: visual acuity, self report cataract symptoms, palliative coping strategies	Not stated	Multiple regression of questionnaires	Specific	N/A	< = 6/60 no longer than 3/12, < = 20/40 no > than year
20	Not stated	Prioritize	Corrected visual acuity of 0.5 or less in best eye or special reasons (increased need for help, inability to work)	N/A	Not stated	Specific	N/A	Yes 3/12
21	Not stated	Prioritize	Coronary anatomy LV function	N/A	Multivariate analysis	Specific	N/A	No
22	Urgency	Prioritize	Surgical speciality (general - 0), urgency rating (category 2 = 0, category 1 = 1.28, employment status (not employed = 0, employed = 0.37) and health insurance = 0.525)	N/A	Survival analysis of waiting	Generic	N/A	No
23	Not stated	Prioritize	Age, symptoms, exercise testing, coronary artery anatomy, employment status and perceived surgical risk	Age 14, symptoms 20, stress test 18, anatomy 30, employment 8, risk 10	Not stated	Specific	Weighted additive linear model	No
24	Unclear	Prioritize	Left main stenosis, unstable angina at angiogram, age at angiography, positive family history, smoking	Left main stem 3.4, UA 2.2, age 2.2, Fam Hx 1.8, smoking 0.6	Regression analysis	Specific	N/A	No

Table 1. Continued

Reference no.	Ethical framework	Purpose	Criteria/factors	Weighting	Derivation of criteria	Specific or generic tool	Summation method	Waiting time recommended
25	Urgency	Prioritize	Adapted Naylor NY not Canadian angina classification, no exercise test, time extended to 12 months	Not stated see Naylor	As Naylor review and regression	Specific	Matrix	12 months max
26	Unclear	Prioritize	Pain degree, pain occurrence, time walked, functional limitations, multiple joint disease, ability to work/care for dependants/live independently, deterioration of pain, require walking aids	20, 20, 10, 10, 10, 10, 10	Based on other hip scores Merle D'Aubigne, Harris, Iowa and Mayo	Specific	Weighted linear model	18 months
27	Urgency	Prioritize	Adult: age, duration, femoral hernia, coexisting medical illness (also looked at child patients)	Not stated	Test proportion and chi-squared correlation	Specific	N/A	No
28	Urgency	Prioritize	Pancreatitis: gallstone < 5 mm, > 20, mulberry-shaped. Acute cholecystitis: no characteristics consistent	Not stated	Logistic regression	Specific	N/A	No
29	Not stated	Prioritize	1) CA disease, extent, vent function, angina symptoms, response to drugs 2) Cardiac enlargement, positive exercise test, smoke, coumarin, unstable angina, left main vessel disease	1) and 2) not specified	1) Not stated; 2) multiple regression	Specific	Not stated	Yes
30	Capacity to benefit	Prioritize	Angina grade, left main stem (high correlation), stress test, LV function, no. vessels (0.5 correlation), LVEF, age, smoking, BMI, gender	Angina 0.26, left main stem 0.15, LVEF 0.15, stress test 0.05, no of vessels – 0.003, BMI – 0.03, age 0.1, sex 0.07, smoking 0.37	Multiple regression of paper patients	Specific	Not stated	No
31	N/A	Prioritize	Angina class, left main stem disease, no. vessels affected (age, sex, smoking and BMI to a lesser extent) efficacy of op for patient	Determined for individual participants	Paper pts, multiple regression between clinical cues and demographics with priority and urgency rankings	Specific	Weighted additive linear model	No
32	Not stated	Prioritize	Age, employment status	Not stated	Questionnaire	Specific	N/A	No
33	Capacity to benefit and urgency	Prioritize	Identified for individuals but not universalized	N/A	Multiple regression of paper patients	Specific	N/A	Yes but not specifically linked to a tool

Table 1. Continued

Reference no.	Ethical framework	Purpose	Criteria/factors	Weighting	Derivation of criteria	Specific or generic tool	Summation method	Waiting time recommended
34	Urgency	Prioritize	Non smokers and young (significant minority), dependents, severe symptoms (majority)	N/A	Questionnaire of patients	Specific	N/A	None
35	Capacity to benefit	Prioritize	Pre-op mortality rate, proportion who failed to benefit, quality of life, life expectancy	Complicated formula see appendix of paper	Expert opinion	Generic	Non-linear	No
36	Capacity to benefit	Prioritize/refer	Age, comorbidity and institutionalization, smoking, dementia	N/A	Opinion for which criteriatio be tested, vignettes – questionnaire for whether have influence	Generic attitudes	N/A	No
37	Not stated	Prioritize	Patient is a child vs elderly, severity of disease, prognosis of disease, increase treatment fees, restriction of expensive Rx	N/A	Opinion for which criteria to be tested – questionnaire for which should have most influence	Generic attitudes	N/A	No
38	Urgency	Prioritize	Age and work status	N/A	Regression from hypothetical cases	Specific	N/A	Yes 6/12 max, but graduated
39	Urgency	Prioritize	Presenting pain syndrome (angina class), coronary anatomy, reversible ischaemia on-non-invasive tests, LV ejection fraction	Not stated	Consensus, literature review	Specific	Not stated	Yes 6/12 max, but graduated
40	Urgency (capacity to benefit as prior)	Prioritize	Severity and stability/response of angina, coronary anatomy, non-invasive ischaemic tests, LV function. Appropriateness: Procedure M & M (For UA cases without med response previous CABG & recent MI)	Not stated	Consensus literature review	Specific	Matrix	Yes
41	Urgency	Prioritize	Rest pain, pain on ADL, problem in work or care giving	N/A	Panel Delphi, literature review	Specific	N/A	Yes

**Table 1.** *Continued*

Reference no.	Ethical framework	Purpose	Criteria/factors	Weighting	Derivation of criteria	Specific or generic tool	Summation method	Waiting time recommended
42	Urgency	Prioritize	Frequency of painful episodes, severity of pain, usual intensity of other suffering, impairment of usual activities, history of major complications or additional significant physical exam test results, life-expectancy implications, expected improvement	Pain freq 9, pain severity 11, suffering 12, impairment 15, complication 8, implications 25, improvement 20 Cataract Corrected VA operated eye 11, or non-op 17, Glare 18, ocular comorbidity (macular degeneration – 15)(other + 2), visual impairment 23, see paper for rest	consensus, weighting – regression of VAS, adjusted for face validity	Both	Weighted additive linear model	No
43	Urgency	Prioritize	Pain and discomfort, condition chronological order after categorized	Not stated	Not stated	Generic	N/A	1 month for category 2, immediate for category 1 Max time 18/12
44	Unclear	Prioritize	Rate of progress of disease, pain or distress, disability or dependence, loss of occupation, waiting time	Progress 32, pain 16, disability 16, occupation 8, wait 16	Consensus	Generic	Linear	No
45	Urgency	Prioritize	Time on list, urgency based on clinical deterioration, urgency based on pts health status, urgency based on social productivity, urgency asked on social factors, e.g. dependants	Not stated	Opinion of authors	Generic	Not stated	No
46	Not stated	Prioritize	Disability D, social factors S, urgency of clinical condition W, time T	$S = 1, D = 1-5, W = 0-5, \text{Time in weeks}$ $a = 1, b = 1, c = 2.2$	Opinion of authors	Generic	Score = (a.S) (b.D) (c)^W x T	No
47	Urgency	Prioritize	Time, urgency related to deterioration, urgency related to disability, urgency based on social factor T = weeks, deterioration = 3, disability = 3, social = 3s	Opinion of authors	Generic	Score = $S^a.D.T^W$	No	No
48	Not stated	Prioritize	Time on list (T), deterioration (W), disability and social factors	$D W S = 1, 2 \text{ or } 3$ Alter a and b for weighting 10, 10, 20, 10, 6	Not stated	Generic	$P = S^a.D.T^W$	No
49	Not stated	Prioritize	Angina status, symptom stability, coronary anatomy, ischaemia on exercise test, LVF	10, 10, 20, 10, 6	Not stated	Specific	Weighted linear model	Yes graduated 12/12
50	Not stated	Prioritize	k = f (urgency), T = time on waiting list	$P = 800(1-e^{-kT})$	Not stated	Generic	Power function	No

ADL, activities of daily living; BMI, body mass index; CA, coronary artery; CABG, coronary artery bypass graft; CBD, common bile duct; CCD, clinical cost of delay; LAS, linear analogue scale; LV, left ventricular; LVF, left ventricular failure; MI, myocardial infarction; M&M, morbidity and mortality; NY, New York; Rx, treatment; UA, unstable angina; VA, visual acuity; VAS, visual analogue score.

urgency of need.<sup>38–40</sup> The remainder of the papers either did not state or were unclear about their ethical basis.

### Criteria

The criteria mentioned in each study are included in Table 1. We categorized the studies on the basis of whether the criteria were for specific procedures or were generic. Fourteen studies included criteria that were generic in nature.<sup>9,10,22,35–37,42–48,50</sup> However, the majority of studies included criteria for specific operative procedures.<sup>7–9,14–21,23–34,38–42,49</sup> Two studies are included in both groups by virtue of the fact that they mentioned both specific and generic criteria.<sup>11,42</sup> The specific procedures/diagnoses covered were cataract surgery,<sup>7,15,16,18–20,42</sup> hip and knee joint replacement,<sup>7,26,41,42</sup> cardiac surgery,<sup>8,14,17,21,23–25,29–34,38–40,49</sup> cholecystectomy<sup>9,28</sup> and hernia.<sup>27</sup>

The generic criteria used in deciding priority tended to be subjective. They covered such facets as priority related to deterioration of the condition, disability and social factors. In contrast the specific criteria were more objective and related to disease specific outcomes (e.g. ejection fraction for cardiac surgery or visual acuity for cataract surgery). The exception was the inclusion of pain for hip and knee replacement or angina in the cardiac surgery setting.

### Development of criteria

#### *Consensus methods*

Consensus methods first involve a literature search for evidence pertaining to the question of interest. This material is supplied to an expert panel. After review of the literature, the panel members identify criteria for priority setting. They independently rate the criteria. These ratings are then analysed and each panelist receives anonymous feedback indicating their ratings in relation to other members. Areas of disagreement are addressed and resolved at a meeting of the panel. The nature and extent of the reviews have a large part in determining the scope of criteria.

Two studies used consensus methods in the development of generic criteria.<sup>42,44</sup> One of the studies used literature reviews on specific procedures (breast cancer, colorectal cancer, inguinal hernia and laparoscopic cholecystectomy) as the basis for consultation on generic criteria.<sup>42</sup>

Consensus methods were used more extensively in determining specific criteria.<sup>7,8,39–42</sup> All of these studies used information from appropriate literature reviews as the starting point for discussion.

#### *Multiple regression*

This method initially takes a clinical endpoint or judgement of priority as a dependent variable. A priori independent variables are then tested to see whether they influence the dependent variables. The statistically significant independent variables are then declared to be criteria. However, using a priori independent variables constrains the criteria that can subsequently be chosen. Nevertheless, regression from either a clinical endpoint or clinical judgement was a favoured method of specific criteria elicitation.<sup>14,19,21,24,30,31,33,38</sup>

#### *Qualitative methods*

Two studies used questionnaires to determine respondents' opinion regarding generic criteria. However, the same flaw as identified with multiple regression occurs as authors preselect the criteria to be tested.<sup>36,37</sup>

A questionnaire of patients was performed in two studies to determine their criteria for cardiac services.<sup>32,34</sup> A semi-structured interview of ophthalmology surgeons was performed to determine their perspective on prioritization of cataract patients.<sup>16</sup> This last study had the benefit over the questionnaire studies of not having predetermined the criteria to be tested.

#### *Additional methods*

Another study once again determined a priori criteria with which to perform a survival analysis on patients waiting for elective surgery.<sup>22</sup> Test proportion and  $\chi$ -squared were used to test correlations in another study.<sup>27</sup> The remainder either did not state how they determined the criteria or acknowledged the criteria were the authors' opinions.

### Prioritization tools

The utilization or development of tools to prioritize patients for elective surgery was by no means universal. Twenty-three studies evaluated or developed tools for this purpose. The method of summation of the criteria differed markedly as did the weighting of different criteria. The assigned weights are listed in Table 1.

Of the studies of generic criteria, nine utilized the criteria in a tool for prioritizing patients.<sup>9,10,35,42,44,46–48,50</sup> The remaining studies either assayed attitudes,<sup>36,37</sup> or did not divulge the utilization of the criteria.<sup>22,43,44</sup> A further study described a 'linear analogue scale' as a global assessment of priority without specified criteria, therefore without subsequent need for summation.<sup>9</sup> Non-linear models, in which there was no monotonic relationship between criteria and final score, were used by six of the studies,<sup>10,35,46–48,50</sup> and linear models by two studies.<sup>42,44</sup> A further study did not state a formula but offered criteria with a range of possibilities for summation.<sup>45</sup>

Fourteen studies of specific criteria utilized a tool for prioritizing patients.<sup>7,8,15,17,18,22,25,26,29–31,39,40,49</sup> A weighted linear model was used to summate criteria in seven papers.<sup>7,8,18,23,26,31,49</sup> Three preferred a matrix model.<sup>25,39,40</sup> The method of summation was not stated in the remaining cases.

### Recommended waiting times

The reporting of recommended waiting times was variable. Thirteen studies included a recommendation of some description.<sup>17,19,20,25,26,29,33,38–40,43,44,49</sup> The comparison of the waiting times is limited by differing circumstances that exist in each study. However, they covered a range of 1 to 18 months. In cardiac surgery the recommended maximum varied between 6 months<sup>17,38–40</sup> and 12 months.<sup>25,49</sup> Two papers addressed recommendations for cataract surgery.<sup>19,20</sup> Both recommended a maximum wait of 3 months for those with priority but utilized different criteria to determine who had priority.

### Special circumstances

There were some papers in which special circumstances were operating. Clinicians in two papers expressed concerns that authorities would use the criteria to specify an arbitrary numerical point cut-off below which surgery would not be funded.<sup>7,8</sup> The response from government was for the minister of health to be accountable for the gap between the funding point cut-off and the clinically indicated cut-off. The authors also commented that age and social factors were included as criteria on the basis of



common clinical practice and social values rather than the results of the literature review. These would be included as long as they were given relatively little weight compared with clinical factors.<sup>7,8</sup>

One paper reported a survey of angina patients' opinion on wait time for cardiac surgery.<sup>34</sup> This paper met our inclusion criteria for this review but the criteria that were developed could be questioned. The introduction and conclusion of the paper address criteria for surgical procedures. However, the patients were asked questions pertaining to their wait for angiography. Extracts from the questionnaire read 'this cardiac unit performs hundreds of angioplasties each year and so not every patient can have their treatment immediately. What factors would you consider it reasonable for cardiologists to take account of, when deciding who should have relatively high priority?' The generalizability of criteria developed for angiography in the cardiac surgery domain is not inherent. The authors justified this approach so as to avoid creating unnecessary stress on patients waiting for surgery.

## DISCUSSION

The objectives of this review were to determine: the different ethical bases on which rationing or prioritization occurs; what different factors/criteria are in use; the different methods/tools of summation that are in use; and where possible to collate these data with resource utilization and waiting time.

The issue of prioritization and/or rationing is ethically if not politically sensitive. The reporting of the ethical basis that the criteria are determined by should be a conscious process in the determination of normative criteria for prioritizing patients. Differing ethical bases may result in different criteria and potentially different patient outcomes. This could result in difficulty in knowing the measures to use in outcome studies, as those for urgency are not necessarily the same as for capacity to benefit. Only 21 (51%) papers reported or were clear about their ethical assumptions. This implies that there are unexamined assumptions in a number of studies. Thus it appears there is debate over the ethical basis for prioritization. What is concerning is that it is not being addressed in many of the studies.

The development of generic criteria showed a dearth of the consensus approach. Only two papers utilized this process with the remainder using criteria that were determined a priori or as a matter of the authors' opinions. This is a significant gap in our knowledge. Whereas similar criteria were developed for specific criteria based on clinical best evidence, this is not possible for generic criteria. This results in a dichotomy between generic and specific criteria. Generic criteria are less evidence based but may be more generalizable and therefore enable horizontal equity contrasted with the specific criteria that are more evidence based but are less able to offer horizontal equity.

On the aspects of summation and weighting we have uncovered a variety of approaches with a predominance of linear models. Again assumptions, this time mathematical, may not have been fully explored. The impact on the prioritization of patients may not have been considered.

Recommended wait times were routinely specified for specific prioritization tools. These were based on literature reviews and were similar for the same procedure. Generic criteria on the other hand tended to have patient charter or maximum wait times externally enforced. These had the weakness of not necessarily reflecting the natural history of different diagnoses and so in some cases being inappropriate.

In summary, scoring systems and booking systems are being developed in the UK, Canada and New Zealand. There has been much work and effort resulting in novel ideas being developed. However, there remain important deficits and blind spots requiring investigation. Consensus methods for the development of generic criteria are under-utilized. Examination of the mathematical assumptions of summation in priority scoring tools has not yet occurred. Additionally, studies of different tools' reliability and validation are required. Untangling the ethical basis to be used is essential so that outcome studies can be undertaken with appropriate endpoints to measure. Furthermore identification of wait times that reflect the natural history of different diagnoses could improve the application of generic criteria.

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