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Balancing the Needs of Acute and Maintenance Dialysis Patients during the COVID-19 Pandemic

A Proposed Ethical Framework for Dialysis Allocation

Rachel C. Carson,[1,2] Brian Forzley,[1,2] Sarah Thomas,[2] Nina Preto,[2] Gaylene Hargrove,[1,2] Alice Virani,[3] John Antonsen,[2] Melanie Brown,[1,2] Michael Copland,[1,2] Marie Michaud,[1,2] Anurag Singh,[2] and Adeera Levin[1,2]

[1]Department of Medicine, University of British Columbia, Vancouver, British Columbia, Canada
[2]BC Renal, British Columbia Provincial Health Services Authority, British Columbia, Canada
[3]Department of Medical Genetics, University of British Columbia, Vancouver, British Columbia, Canada

Correspondence: Dr. Rachel C. Carson, Faculty of Medicine, Nanaimo Regional General Hospital, 1200 Dufferin Cres, Nanaimo British Columbia, Canada V9S 2B7. Email: rachel.carson@viha.ca

Abstract
The COVID-19 pandemic continues to strain health care systems and drive shortages in medical supplies and equipment around the world. Resource allocation in times of scarcity requires transparent, ethical frameworks to optimize decision making and reduce health care worker and patient distress. The complexity of allocating dialysis resources for both patients receiving acute and maintenance dialysis has not previously been addressed. Using a rapid, collaborative, and iterative process, BC Renal, a provincial network in Canada, engaged patients, doctors, ethicists, administrators, and nurses to develop a framework for addressing system capacity, communication challenges, and allocation decisions. The guiding ethical principles that underpin this framework are (*1*) maximizing benefits, (*2*) treating people fairly, (*3*) prioritizing the worst-off individuals, and (*4*) procedural justice. Algorithms to support resource allocation and triage of patients were tested using simulations, and the final framework was reviewed and endorsed by members of the provincial nephrology community. The unique aspects of this allocation framework are the consideration of two diverse patient groups who require dialysis (acute and maintenance), and the application of two allocation criteria (urgency and prognosis) to each group in a sequential matrix. We acknowledge the context of the Canadian health care system, and a universal payer in which this framework was developed. The intention is to promote fair decision making and to maintain an equitable reallocation of limited resources for a complex problem during a pandemic.

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Introduction
In managing the COVID-19 pandemic, programs around the world are faced with several challenges, including critical shortages of supplies, equipment, and personnel. If demand for health care services exceeds capacity, priority shifts from the individual toward the public common good (1,2). Triage decisions raise multiple ethical dilemmas, including balancing the needs of acute and maintenance patients who require dialysis, both inside and outside hospital settings. Past experience with dialysis resource allocation provides a powerful illustration of the ethical dilemmas that a shortage presents (3,4), and brings into focus the importance of adopting an ethical, transparent decision-making process (5–8).

The current pandemic highlights these issues, with many patients with COVID-19 developing AKI requiring dialysis, including up to 20%–30% of patients with COVID-19 who are admitted to the intensive care unit (ICU) (9). Media reports (10,11), a recent publication (12), and an International Society of Nephrology statement (13) describe the importance of planning for dialysis care during COVID-19 surges. To the best of our knowledge, a principle-driven framework considering multiple distinct patient groups has not been previously published.

Unlike ventilation decisions, dialysis is offered for a wider range of indications, with different prognostic implications if temporarily withheld, and with some flexibility in time horizons. Maintenance dialysis resource use is predominantly in the outpatient setting, either facility- or nonfacility-based. It is inappropriate and impractical to use existing critical care triage criteria (14–16) when considering allocation of resources to outpatients receiving maintenance hemodialysis. Thus, we propose that dialysis resource allocation must compare and triage two diverse patient groups who require dialysis (both acute and maintenance, inpatients and outpatients). This shared common resource pool of dialysis equipment and staff must be distributed fairly and ethically, especially in settings where outpatient dialysis facilities are located within hospitals. The approach must address the complexities arising from the heterogeneous clinical status and prognosis of these patient populations.

Anticipating strain on the health system because of COVID-19, BC Renal, a provincial network responsible for planning and resourcing kidney care in British Columba, Canada, created a transparent framework for allocating dialysis resources during the pandemic, founded in ethical principles. The Canadian health care system provides maintenance dialysis for outpatients predominantly within hospital settings, as well as promoting smaller satellite units and home-based therapies. The reliance on facility-based staff and machines to provide both outpatient maintenance dialysis and acute in-hospital dialysis is one of the drivers of this framework. This situation may not exist in all jurisdictions, but does in many. The framework promotes fair decision making and maintains an equitable allocation of resources while preparing for a potential surge in the number of patients requiring acute hemodialysis. Although the principles outlined in this document are broadly applicable, implementation will vary depending on the local health care context and the available resources.

Materials and Methods

The authors defined the scope of the framework, including addressing surge capacity, allocation decisions if demand outstrips capacity, relevant ethical principles, and optimal communication with patients and health care providers. We engaged a multidisciplinary stakeholder group to capture a diversity of perspectives and input at the time of initial proposals and writing. We included doctors, ethicists, administrators, nurses, and patients from different geography and health journeys. We have further included a larger stakeholder group with overt representation from underserviced and disadvantaged populations to continue the work reported here. A research librarian conducted a focused literature search, leveraging our provincial clinical network to identify other relevant information sources. We then consulted with several other nephrology programs outside of British Columbia and Canada and tested the proposed algorithm using a simulation of a variety of patient presentations in a resource limited unit (Supplemental Material, Dialysis Allocation Framework Algorithm Simulation spreadsheet). The final framework was reviewed and endorsed by all stakeholders. This framework was created in the context of a high-income country, with universal health care access for all patients in Canada, where dialysis is provided through government institutions, including both facility and home-based therapies, predominantly under the jurisdiction of single hospitals or health authorities. The framework does not presume that need for dialysis acutely is solely driven by those infected by COVID-19, and thus can be applied to all circumstances where demand for services outstrips supply.

Key Actions Required for Patient-Centered Management of Resources during a Pandemic

The stakeholder group identified the following key actions as essential for successful ethical resource management:

(*1*) Ensure that a system and structure is in place for execution of the emergency plan, established in advance.
(*2*) Ensure the ability to assess system capacity for acute and maintenance dialysis exists, ideally using electronic tools.
(*3*) Ensure good communication to patients, families, and health care providers about potential changes and the supporting rationale.
(*4*) Increase dialysis capacity with existing human and dialysis machine resources by assessing the suitability of patients on maintenance hemodialysis for alteration of hemodialysis schedules, diet, and other medication changes, and by developing contingencies for alternative dialysis modalities for both inpatients and outpatients (such as continuous KRT, peritoneal dialysis).
(*5*) Enable the implementation of a Dialysis Triage Algorithm that includes the needs of patients on acute and maintenance dialysis.

Tools and measures to support these activities are described below.

Assessing and Expanding Capacity in Hemodialysis Units

Knowledge of total local capacity and the ability to respond to a surge in need for dialysis services is essential (17). Centralized information about the number of dialysis machines, portable reverse osmosis systems, plumbing and water requirements, and nursing and technical support personnel must be accessible to the leadership team. Emergency health plans should account for best and worst case scenarios modeled on the best-available data. Data from regions already affected by an outbreak can be used to inform emergency planning, while accounting for differences in circumstances. In the context of the current COVID-19 pandemic, the possibility of a second, more severe wave of infection (18) should encourage nephrology leadership teams to engage in this capacity assessment and planning exercise as early as possible, and routinely.

Table 1 describes transparent eligibility criteria for hemodialysis dose reduction in patients receiving maintenance dialysis. These categories were developed by the BC Renal Hemodialysis Committee, a multidisciplinary group of clinicians across the province of British Columbia. There are five categories on the basis of patient characteristics, as assessed by a clinical team. Coupled with education about diet and emergency medication supplies (diuretics and potassium binders), these strategies may enable safe temporary reduction in maintenance dialysis dose for specific individuals. Individually assessing patients who are on long-time dialysis for the ability to have hemodialysis at a safely reduced frequency and/or duration permits a rapid and flexible increase in system capacity to deliver dialysis services without additional machines or nurses. This approach is intended to be applied in advance of when resource reallocation is needed.

Timely and Clear Communication to Patients and Health Care Providers

Patient partners and health care providers strongly endorsed the need for clear communication throughout the pandemic, ideally before implemented changes. Open and clear discussion about what might happen, why, and the implications for patients and families is critical. Preprepared documents outlining key concepts in accessible, jargon-free language can help support patients and care providers in discussing questions and concerns, and further enhance open and transparent planning processes. Feedback suggested that preparatory discussions foster additional opportunities to articulate patient goals, highlight patient-specific considerations and wishes, and identify resources to help meet the patient's goals of care (19,20). During pandemic situations, with focus on short-term capacity and those affected by the virus, patients on

Table 1. Categories of eligibility for dialysis dose reduction in patients on maintenance dialysis

Assume patients are modifying their behaviors (*e.g.*, dietary adherence) to the best of their ability. Other criteria to consider include
- residual kidney function/urine output (responsiveness to diuretics for potassium or volume management),
- ability to tolerate potassium resin binders,
- ability to tolerate further dietary restrictions and dialysate [K] reduction.

Patient Characteristics		Volume Status		Potassium Status
Category 1	Stable, suitable for reduced frequency HD	Controlled: IDWG<4%	and	Controlled: serum potassium <5 mmol/L and dialysate potassium >2 mmol/L
Category 2	May be suitable for shorter duration HD runs	Controlled: IDWG<4%	and	Uncontrolled: serum potassium >5 mmol/L or dialysate potassium ≤2 mmol/L
Category 3	Intermediate: physician discretion to be used for reduced duration HD	Borderline: IDWG ~4% or 4 kg and/or recent admission for volume overload	and/or	Uncontrolled: dialysate potassium ≤2 mmol/L or serum potassium ≥5 mmol/L
Category 4	Unsuitable for short or less frequent HD	Uncontrolled: IDWG >4% or >4 kg	and	Uncontrolled: serum potassium >5 mmol/L or dialysate potassium ≤2 mmol/L
Category 5	Case-by-case assessment: use physician discretion when deciding on dialysis frequency/duration. Patients who started HD within the past 1 mo (noting that new patients may have delayed longer than usual to start during pandemic surge, and may be metabolically and/or hemodynamically unstable and require frequent dialysis to stabilize). Patients on HD four to five times per week, but have acceptable potassium or IDWG			

HD, hemodialysis; IDWG, interdialytic weight gain.

maintenance dialysis and their families must not feel abandoned by their health care teams. Our patient partners articulated that clear and honest communication is critical to reduce fear that patients may experience, and create an atmosphere of mutual trust and solidarity. The BC Renal website (www.bcrenalagency.ca) contains communication tools developed in three languages, which were widely distributed to support patients and health care workers. One document describes the rationale and possible changes affecting the dialysis unit functioning and schedules, and the other describes the importance of advance care planning. The documents underscore that changes are in accordance with provincial guidance documents, and reassure patients and families that they will not be abandoned.

Planning for Acute Dialysis Resources

The recommended KRT for patients with COVID-19 who are in critical care areas is continuous KRT, because it limits the number of staff who must enter COVID-19 care areas and reduces movement of equipment and supplies (17). Emerging experience indicates acute peritoneal dialysis is both feasible and effective for ventilated patients (21), and has been recommended for AKI to increase program capacity. Further, not all patients requiring acute dialysis have COVID-19, nor are they all in ICU settings. Thus, all modalities can be used.

A surge in the need for intermittent hemodialysis in acute-care inpatient settings may directly affect capacity and require reallocation of dialysis resources from patients on maintenance dialysis to those requiring acute dialysis. Where staff and machine resources are housed in one location (hospital based), staffing rather than machine supply may be the greater determinant if staff exposed to COVID-19 must self-isolate or take stress leave. Capacity expansion will also depend on facility infrastructure, such as water treatment availability in spaces that are being repurposed because of the pandemic.

If facility-based maintenance dialysis capacity has been maximized, but dialysis needs exceed capacity, triage is the option of last resort. The overarching purpose of a triage system is to minimize mortality and morbidity for a population overall, as opposed to individual mortality and morbidity risk (22).

Ethical Framework, Triage, and the Fair Allocation of Dialysis Resources

The working group applied key ethical principles from other resource allocation frameworks during the COVID-19 pandemic and other crisis situations. The guiding ethical principles that underpin this framework are (*1*) maximizing benefits, (*2*) treating people fairly, (*3*) prioritizing the worst-off individuals, and (*4*) procedural justice (2,23) (Table 2). The last principle focuses on fairness of process, and the first three principles aim to guide prioritization within the framework. Priority is given to those patients who have the strongest immediate need for KRT and are otherwise expected to have the greatest chance of surviving, independent of whether their KRT needs are short versus long term.

The framework specifies that allocation decisions must not further perpetuate inequities by further disadvantaging marginalized populations. Decision makers must actively guard against relying on ethically indefensible criteria (age, race, ethnicity, ability to pay, disability) or subjective quality-of-life assessments in allocation and triage decisions. When patients are similar with respect to objective prognostic features, age group may be considered in the decision-making process, and we share the view that use of age-related "life cycle" as a tie-breaker is ethically justifiable (the so-called "fair innings" approach) (1,14,16,24–27).

Table 2. Ethical principles

Ethical Principle	Description
Maximizing benefits	Priority should be given to patients with highest needs and greatest capacity to benefit to maximize health benefits for all.
Treating people fairly	Those with equal need should have equal access to resources. Factors such as age, racialized background, ethnicity, disability, ability to pay, socioeconomic status, pre-existing health conditions, perceived social worth should not be considered unless they are relevant to need and potential for benefit.
Prioritizing worst off	Priority should be given to those with the greatest need first.
Procedural justice	Decisions should be evidence-based, defensible, transparent, and clearly communicated. Stakeholder input should be sought, and clear appeals mechanisms should be established.

Finally, in keeping with the dominant view in Western bioethics (28,29), this framework does not make an ethical distinction between withholding and withdrawing life-sustaining treatment. However, withdrawal can be more challenging psychologically, particularly for maintenance hemodialysis as an established course of treatment (30).

The Complex Challenge of Allocating Dialysis Services

The complexity of the multiple settings (inpatient and outpatient) and patient populations (acute and maintenance dialysis) involved in allocating dialysis resources forces decision makers to consider multiple dimensions. Triage must carefully balance consideration of immediate, near, and long-term effects of decisions. The working group identified two distinct allocation concepts (urgency and prognosis) to be applied in a sequential matrix to two distinct populations: patients on acute and maintenance hemodialysis. This creates a heat map of four triage categories according to accepted triage methodology: red (immediate), yellow (urgent), green (delayed), and blue (expectant) (22).

Allocation Concept 1: Urgency of Need. Inpatients (those needing acute dialysis and hospitalized patients on maintenance dialysis) are categorized on the basis of three categories of urgency of need for dialysis that day (emergent versus urgent versus can be safely deferred that day). Outpatients on maintenance dialysis are categorized on the basis of two categories of urgency of need for dialysis that day (about to decompensate/high risk of predictable harm versus can be safely deferred that day). We do not differentiate those with or without COVID-19, only the need for dialysis services. We acknowledge that urgency may be subjective, and if necessary, triage teams could further develop more discrete criteria.

Allocation Concept 2: Prognosis. Patients are categorized on the basis of ethical principles of utility, efficiency, and equity, whereby those with the greatest need and greatest likelihood of benefit are prioritized. Table 3 is a prognosis-based scoring table for the acute inpatient population, adapted from White *et al.* (14,16). It estimates acute prognosis using the Sequential Organ Failure Assessment (SOFA) score, and relative longer-term prognosis using the Charlson comorbidity index (CCI). A recent systematic review (31) identified the CCI as the most commonly used prognostic tool in the incident maintenance dialysis population, and it has been well validated for kidney patients (32). Our framework follows an approach adopted by others (33), and purposefully does not rely completely on longer-term (*e.g.*, 10 year) life expectancy to avoid further disadvantaging those with lower long-term life expectancy from factors such as diseases exacerbated by social inequalities.

Figure 1 shows how this two-step approach permits ethically informed dialysis allocation. The algorithm is intended to support facilities that function as a unit making KRT decisions, including care in hospitals and, potentially, outpatient dialysis units, if feasible. The algorithm applies to all patients with an indication for KRT, including acute and maintenance dialysis. Allocation concept 1 (urgency) is initially applied to identify and triage all patients for whom dialysis can be safely deferred that day (including clinical effect of previous deferrals) to the green group. Patients who have the worst prognosis are triaged to the blue group. A matrix of urgency and prognosis is then applied to the remaining patients to triage them to either the red or the yellow group (34). Patients in the red group have top-priority access to dialysis, and patients in the yellow group receive dialysis if capacity permits. Patients are retriaged on a daily basis, and may receive priority one day and not the following day according to their clinical parameters and score. This includes intermittent hemodialysis and continuous KRT. Within either color group, if the number of patients exceeds capacity, then the patients are ranked by their score and prioritized accordingly. Patients with identical scores are reallocated by age range, according to their life cycle and the fair innings principle. Any final tie breaking proceeds by random allocation (lottery). Developing a weighted lottery system that considers, for example, socioeconomic deprivation status, may be helpful in further delineating fairest allocation (35,36). To limit the possibility that anyone will be denied resources unnecessarily, dialysis capacity and the need for triage should be assessed on an ongoing basis to support timely de-escalation. Transparent and clear communication is essential to address potential provider and patient distress when withholding dialysis.

The Role of Triage Teams

Surge level declarations are typically determined by public health officials and supported by extensive consultation. Table 4 describes surge levels and recommended responses. Region-specific demographics and legislative requirements must be considered in the implementation of any prioritization plan. Triage teams, not involved in direct patient care, ensure the fiduciary relationship between physician and patient is maintained, promote consistent and objective decisions, and relieve the burden of decision making from providers who may feel distressed by allocation decisions during a crisis (37). The exact composition of the dialysis triage team should be determined locally, and may involve an administrator, a nephrologist,

Table 3. Proposed prognostic prioritization score

Specification	0 Points	1 Points	2 Points	3 Points	4 Points (Patients in this Column would Already Be Triaged to Blue Group for Poor Prognosis, as Noted in Algorithm 1)
Predicted short-term survival (SOFA score)	Not acutely ill, *e.g.*, maintenance HD outpatient	SOFA<6, *e.g.*, inpatient	SOFA=6–9, *e.g.*, ICU patient	SOFA=10–12, *e.g.*, ICU patient	SOFA>12, *e.g.*, ICU patient
Predicted near-term survival (Charlson comorbidity index)	Charlson Comorbidity Index 0, 1, or 2 points	Charlson Comorbidity Index 3 or 4 points	Charlson Comorbidity Index 5 or 6 points	Charlson Comorbidity Index 7–9 points	Severe comorbidities with death expected within 6 mo, *e.g.*, Charlson Comorbidity Index ≥9

Patients are individually scored and ranked. Lower scores receive priority for KRT that day, according to capacity that day. The SOFA score is a mortality prediction score that is on the basis of the degree of dysfunction of six organ systems, and can be used to determine level of organ dysfunction and mortality risk in ICU patients (see https://qxmd.com/calculate/calculator_268/sequential-oron-failure-assessment-sofa). The Charlson Comorbidity Index is a mortality prediction score on the basis of the presence of 17 specific comorbidities and age, and has been validated in multiple studies involving kidney failure (https://www.mdcalc.com/charlson-comorbidity-index-cci). Tie-breaking principles: life cycle (the fair innings principle) followed by random allocation. Algorithm 1 and Table 4 operate on the principle of maximizing utility or maximizing benefit for the greatest number (saving the most lives and life years in terms of near-term survival). If further prioritization is required, then it is made on the basis of where individuals currently stand in the expected life cycle, with priority given to the worst-off individuals, defined as those who have had the least opportunity to experience life. This is the "fair innings principle" (equity/fairness). Individuals are ranked by age range (*e.g.*, 12–40, 41–60, 61–75, and >75 years) roughly indicative of life stages, with priority given to those at an earlier life stage. If, after applying the life-cycle considerations tiebreaker, there are not enough resources to treat all patients within the lowest-ranked life-cycle group, then a lottery (*i.e.*, random allocation) should be used to ultimately break the ties within that life-cycle group. SOFA, Sequential Organ Failure Assessment score; HD, hemodialysis; ICU, intensive care unit.

an ethicist, and an allied health care professional. Once emergency triage status (stage 4 in Table 4) has been declared, these local triage teams are responsible for the allocation of available dialysis services within their respective jurisdictions. A larger regional triage team may be helpful to provide guidance and oversight to the local teams, ensure regional coordination of resources, and act as an executive decision-making body in case of appeals. Predetermining these teams, roles, and responsibilities is important to do before emergency situations. Communication between critical care and nephrology teams is important to ensure concordant planning of life support therapies.

Strengths and Weaknesses

This evidence-informed framework aims to create a fair accountable process. It was created with and vetted by multiple stakeholders, uses established scores to estimate prognosis, and accounts for multiple dimensions of decision making (prognosis, urgency, and mixed patient populations). The inclusion of patient partners, administrators, ethicists, nephrologists, and nurses is a strength. Work with a more diverse group of patient partners is required and is already underway.

We have used the CCI in our simulation, but recognize that it fails to identify patients with anticipated lower survival rates owing to frailty and could assign priority inappropriately. We considered adding the Clinical Frailty Scale to address this, but did not to avoid additional complexity and concerns around the effects on vulnerable populations (15,38). There is significant clinician workload associated with calculating CCI and SOFA scores to apply the algorithm to large dialysis programs and hospitals. We acknowledge that SOFA has limits for prognostication, but note its adoption in most ventilator triaging protocols in the United States (39) and reasonable discrimination among patients with AKI (40–45). Our vetting process identified the importance of objective measures of prognosis; thus, we opted to use the CCI as an amendment to the strategy by White *et al.* (16). Overemphasizing comorbidities and long term prognosis (*e.g.*, 10-year time frame) risks deprioritizing patients already disadvantaged on the basis of socioeconomic and racial status. However, the systematic review (31) of CCI use in kidney disease largely studied a time frame of 6 months to 5 years, which was our intended prognostic time horizon.

The overall feasibility of our approach depends on the health care environment and would be best supported in centers caring for inpatients and outpatients as a unit. However, it could be adapted to separate hospital and outpatient dialysis clinics that can function as a unit. Ideally, access to electronic tools to facilitate calculations would further aid in the application of the algorithms both for improving capacity and for triage. This protocol requires a significant amount of data collection and local site organization and communication, but we anticipate much of the data and scores will be concordant with routine care and ventilator triaging protocols and will improve patient outcomes and moral distress during a time of crisis.

Limitations

The suggestions and recommendations in this paper are from a Canadian context, on the basis of BC Renal stakeholder opinion, and thus potentially subject to bias. However, we have attempted to mitigate this through

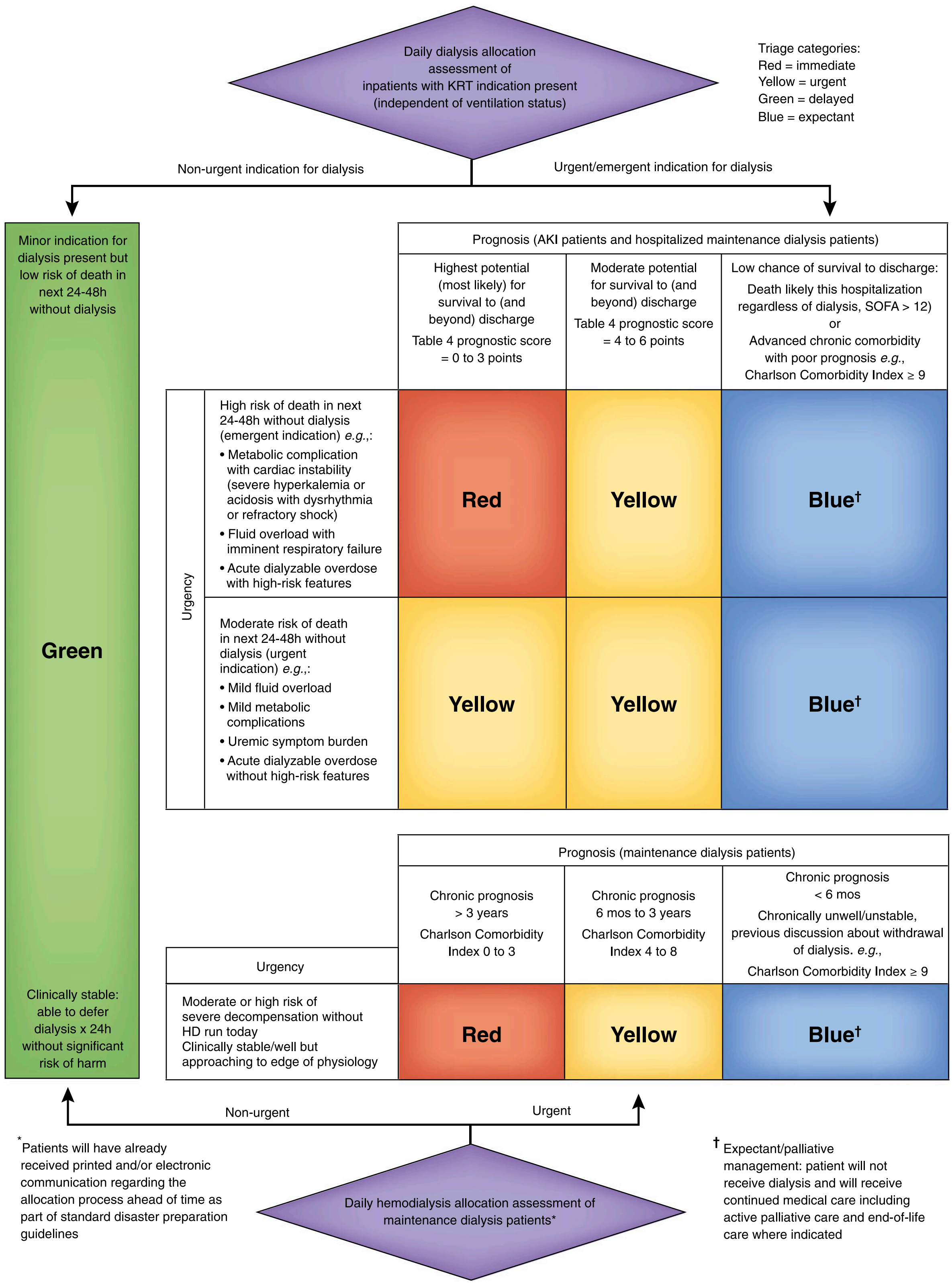

Figure 1. | **Algorithm for dialysis allocation.** HD, hemodialysis; SOFA, Sequential Organ Failure Assessment score.

extensive vetting both within and outside the kidney community. Because of the emerging and rapidly evolving situation of the COVID-19 outbreak, consultation for this work was done in a relatively short time period, between March and May 2020. Although we did not previously formally engage stakeholders from communities of

Table 4. Surge levels and recommended responses

Description		Surge Levels and Recommended Responses
Stage 1: conventional operations, minor surge	All dialysis resources levels are fully intact. The hospital HD unit is functioning within usual bed capacity and adequate staffing levels	• Disaster preparedness should be emphasized in HD units before an increased surge capacity. Patients should be aware of surge strategies well in advance • Provide all patients with documents on emergency preparedness, which should include diet and fluid plans • Assess all patients for fitness for dialysis dose reduction to expand capacity • Prioritize advance care planning discussions/serious illness and goals-of-care conversations to align care with patient goals and wishes • Consider cohorting inpatients with COVID-19 out of the HD unit, when possible • Cohorting of patients with COVID-19 within inpatient units not in critical care areas should be considered, to optimize nursing ratios during off-ward dialysis beyond 1:1 • Consider moving patients with COVID-19 who require dialysis to adjacent rooms or multibed rooms within COVID-19 units, to allow for this • Work with dialysis vendors and offsite units to optimize resources, communication, and joint decision-making structures across organizations
Stage 2: conventional operations, moderate surge	All dialysis resource levels remain intact, but there is a possibility that staffing resources may become depleted. The hospital HD unit is functioning within usual bed and staffing capacity	• Continue to keep patients informed of emergency stage/surge level • Identify patients currently dialyzing in-center who can potentially dialyze in community units, and facilitate transfer where possible • Identify potential home dialysis patients and fast track training • Review and update Resuscitation Orders (code status/MOST/POLST) • Maximize the use of all continuous KRT machines in critical care areas • Determine essential components of sufficient HD care. Consider deferring routine: blood work, access flow surveillance, and medication reviews • Determine capacity of nurse to support multiple patients at essential service levels • Determine interdisciplinary supports available to assist in care • Consider repatriating HD-trained staff from predialysis and transplant clinic–based service areas, and how to provide refresher training • Explore other roles in health care (included and excluded), and determine how they can support direct care
Stage 3: contingency operations, major surge	An increase in demand for dialysis services beyond the normal capacity, yet still maintainable with changes to staff ratios and HD treatment duration. Each HD unit remains responsible for determining the most effective approach to manage the increased demand volumes	• Activate dialysis dose reduction for patients on long-term HD ◊ Consider HD two times a week for category 1 patients ◊ Consider reduced duration HD for category 2 and 3 patients (may be facilitated by potassium resin binders and very low [K0 or K1] potassium dialysate baths) • Extend usual nurse-to-patient ratio in ICU to acceptable and agreed upon staffing that includes ICU/HD registered nurses and nephrology technicians. Outline strategies for urgent assistance if patient care needs change • Consider increasing the utilization of PD urgent starts • Proactively assess prognosis for patients on long-term HD using the Charlson Comorbidity Index, in preparation for triage if stage 4 crisis is reached • Increase nurse-to-patient ratio in HD unit, and cohort stable patients to maximize ratio in a team-based approach • Transfer patients on long-term HD to other geographic regions with dialysis capacity
Stage 4: crisis operations, *emergency triage status*	A significant increase in demand for HD services, which affects care at a regional level. More patients are requiring services than available resources. The system is operating at a crisis surge level, and the increase in demand overwhelms the nephrology resources of an individual hospital and region	• Organize provincial/statewide response. A coordinated response at the regional network level is required • At stage 4, the Emergency Operating Center should provide direction to clinical and operational leads and verify they are prepared to shift KRT service delivery to a triage model • Increase the utilization of PD urgent starts • Implement triage allocation framework • Allocation of available dialysis resources determined by the triage team

HD, hemodialysis; MOST/POLST, Medical Orders for Scope of Treatment/Physician Orders for Life-Sustaining Treatment; ICU, intensive care unit; PD, peritoneal dialysis.

people of color, Indigenous people, those with disabilities, and rural populations to provide their perspectives, we have subsequently embarked on a process to engage those groups.

Conclusions

We have highlighted the complexities specific to dialysis provision during a pandemic, arising from wider ranging indications and degrees of urgency, unique prognostic considerations, and management of two distinct patient populations requiring the same resources. It is imperative that health care leaders identify and implement clear frameworks in advance of crisis conditions to ensure ethical decision making and ease moral distress. These recommendations are intended to provide the best care possible during a time of altered priorities and reduced resources.

We highlight the importance of clear communication before and during emergency situations. To the extent that this approach fosters trust and confidence, it helps to promote acceptance even in the face of continued disagreement and uncertainty. This trust and confidence may help mitigate the suffering and distress both of patients and families, as well as health care providers (46,47). This framework is intended to form a critical component of a broader, comprehensive pandemic dialysis response plan to help enable optimal outcomes as we navigate public health crises now and in the future.

Disclosures

M. Copland reports consultancy agreements with NxStage Medical; receiving honoraria from NxStage Medical, Sanofi, and Takeda; serving as a scientific advisor or member of NxStage Medical; and serving on the speakers bureau of NxStage Medical. G. Hargrove reports receiving honoraria from Celgene and Otsuka; and other interests/relationships with Kidney Foundation of Canada. A. Levin reports employment with BC Provincial Renal Agency; consultancy agreements with Amgen, AstraZeneca, Boehringer-Ingelheim, Johnson and Johnson/Jansen, and Reata; receiving research funding from AstraZeneca, Boehringer-Ingelheim, Canadian Institute of Health Research, Janssen, Johnson and Johnson, Kidney Foundation of Canada, Merck, National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, Ortho Biotech, Otsuka, and Oxford Clinical Trials; and serving as a scientific advisor or member of AstraZeneca, Boehringer-Ingelheim, *Canadian Journal of Kidney Health and Disease*, Certa, Johnson and Johnson, Kidney Foundation of Canada, Otsuka, and Reata. N. Preto reports employment with Provincial Health Services Authority (BC Canada) and serving as a member of the Review and Oversight (RERO) Technical Committee of the Human Research Standards Organization. A. Singh reports serving as a member of Kidney Foundation of Canada. S. Thomas reports employment with BC Renal. All remaining authors have nothing to disclose.

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Supplemental Material

This article contains the following supplemental material online at http://cjasn.asnjournals.org/lookup/suppl/doi:10.2215/CJN.07460520/-/DCSupplemental.

Supplemental Appendix 1. Dialysis allocation framework algorithm simulation.

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R.C.C. and B.F. contributed equally to this work.

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