

Appendix: Detailed assumptions for treatment

Acute Treatments for cardiovascular disease

Acute MI or unstable angina will be treated with aspirin (initial dose of 325 mg then 75-100 mg daily), heparin (12,500U SC bid for 3 days, supplied as 10,000 U/ml), and glyceryl trinitrate (estimated average of 5 doses of 0.3 mg over 3 days per patient, given as needed), as well as the morphine that is already in the IEHK (1). Electrocardiography equipment would be desirable. Thrombolytic treatment is not practical in emergency settings.

Acute stroke will be treated with aspirin (150-350 mg daily) (2).

Acute heart failure will be treated with glyceryl trinitrate (estimated average of 5 doses of 0.3 mg over 3 days per patient, given as needed) and furosemide (estimated average of 80 mg) as well as the morphine that is already in the IEHK (3-5).

Treatments after stabilization of cardiovascular disease

After being stabilized, patients with acute MI or unstable angina will be treated with aspirin (75-100 mg daily), atenolol (50 mg daily), enalapril (5 mg bid) and simvastatin (20 mg daily) (6) and will be given a 90 day supply. Similar considerations will apply to patients presenting with stable coronary disease (scenario 2).

After being stabilized, patients with stroke or TIA will be treated with aspirin (75-100 mg daily) (7) and simvastatin (20 mg daily) (8) and will be given a 90 day supply. Most

patients will receive enalapril 5 mg BID either for treatment of hypertension or for secondary prevention of vascular disease (9). Similar considerations will apply to stable patients presenting with prior stroke (scenario 2).

After being stabilized, patients with acute MI, stroke or TIA will receive add-on treatment with hydrochlorothiazide (12.5 mg daily) if blood pressure is >140/90 (10) despite enalapril 5 mg bid (anticipated to occur in 33% of patients), and will be given a 90 day supply. Third line agents will not be added. Higher achieved blood pressures will be accepted in some patients but this would not be expected to materially affect the estimated quantity of medications required.

After being stabilized, patients with acute heart failure will be treated with enalapril (10 mg bid) (11), atenolol (11) and furosemide (80 mg daily) and will be given a 90 day supply. Although low atenolol will be initiated at low dose (12.5 mg daily) after enalapril treatment is established and titrated up, 50 mg doses daily have been used when estimating dose requirements, since this does not materially influence costs or space requirements in the IEHK, and titration regimens will vary. Similar considerations will apply to patients presenting with stable heart failure (scenario 2), although we have assumed that such patients will not require atenolol treatment if clinically stable. Spironolactone will not be given due to the risk of hyperkalemia.

Treatments for diabetes

Acute severe hypoglycemia in people with known diabetes will be treated with two ampoules of dextrose 50% and with 5% dextrose infusion if required. Diabetic ketoacidosis or hyperosmotic non-ketotic hyperglycemia will be suspected in patients with blood glucose >18 mmol/l and treated with insulin (expected average requirement of 60 units per case) and intravenous fluids.

Once stabilized, adults and children with hyperglycemia syndromes will be treated with insulin and given a 90-day supply (average of 30U or 20 U for adults and children respectively per day of 30/70 insulin, supplied as 10 ml vials of 100U/ml: an average of 3 vials per adult user and 2 vials per child user).

For scenario 2, children with stable diabetes will be assumed to require insulin at the dose above. Adults will be assumed to require oral hypoglycemic agents. Although metformin is contraindicated when kidney function is severely impaired (estimated glomerular filtration rate <30 ml/min/1.73m²), this level of kidney dysfunction is relatively uncommon and therefore we have assumed that metformin (2.5 g/d) will be the first line agent for all adult patients presenting with stable diabetes. Glibenclamide (2.5 mg daily) will be added if needed to achieve glycemic control and has been assumed necessary in 25% of patients.

Routine home laboratory monitoring of glycemic control will not be provided. An average of one glucose test strip per patient per week will be made available for checking glucose at the time of clinic visits.

Treatments for hypertension

Hypertensive emergency is defined by blood pressure $>200/120$ plus the presence of symptoms such as headache, confusion or coma; or other symptoms of end-organ damage. It will be managed using the intravenous hydralazine that is already in the IEHK together with oral antihypertensive agents (enalapril 10 mg bid, hydrochlorothiazide 12.5 mg daily, amlodipine 10 mg daily, atenolol 50 mg daily). Although other definitions of hypertensive emergency exist, using an alternative definition would not be expected to materially influence the estimates of the medication quantities required for the IEHK.

Severe hypertension (hypertensive urgency) is defined by extremely high blood pressure (levels not specified, but on the order of $>200/120$) without symptoms and can be managed by the addition of oral medication (enalapril, hydrochlorothiazide, amlodipine, atenolol as needed, same doses as above).

Once stabilized, patients with hypertensive emergency or urgency will be managed with oral antihypertensive agents (enalapril, hydrochlorothiazide, amlodipine, atenolol as needed, same doses as above) and given a 90 day supply.

Hypertension in pregnancy will be managed with the methyldopa that is already available in the IEHK. Amlodipine 5 mg daily will be added if needed.

For purposes of estimating the required quantities of medications, we assumed that the usual sequence of oral drugs for chronic control of hypertension would be enalapril, hydrochlorothiazide, then amlodipine or atenolol. However, clinicians are free to use an alternative order at their discretion.

Treatment for chronic respiratory disease

Patients with acute asthma exacerbations will receive prednisolone (estimated dose requirements 30 mg for five days for adults and 20 mg for three days for children), and inhaled salbutamol (100 mcg bid) (12).

Once stabilized, patients with asthma will be treated with short acting bronchodilator (salbutamol 100 mcg bid as needed) and inhaled beclomethasone (100 mcg bid), and given a 90 day supply (12). Similar considerations will apply to patients presenting with stable asthma (scenario 2).

Acute exacerbations of COPD will be treated with oral amoxicillin (already in the IEHK), and oral prednisolone 30 mg for seven days (13).

Once stabilized, patients with COPD and a history of exacerbations should be treated with short acting bronchodilator (salbutamol 100 mcg qid as needed) and inhaled beclomethasone (100 mcg bid), and given a 90 day supply. Although some physicians reserve the use of beclomethasone treatment for patients with a history of multiple COPD exacerbations, this will not materially influence costs or space requirements in the IEHK

(13). Similar considerations will apply to patients presenting with stable chronic respiratory disease (scenario 2). Long acting bronchodilators will not be used given uncertainties about how to identify patients who would optimally benefit.

Appendix Table: Data sources

| Citation | Incidence of acute presentation | Prevalence of chronic presentation | Note |
|-----------------------------------|------------------------------------|-------------------------------------|---|
| Deshmukh 2011 (14) | Adults with hypertensive emergency | | |
| Zampaglione 1996 (15) | Adults with hypertensive urgency | | Hypertensive urgencies are 3 times as common as emergencies |
| Danaei 2011 (16) | | Adults with hypertension | |
| Li 2014 (17) | Adults with severe hyperglycemia | | |
| Li 2014 (17) | Adults with severe hypoglycemia | | |
| Rewers 2002 (18) | Children with severe hyperglycemia | | |
| Rewers 2002 (18) | Children with severe hypoglycemia | | |
| Danaei 2011 (19) | | Adults with diabetes | |
| American Diabetes Association (6) | | Children with diabetes | 4% of all diabetes is Type 1 |
| Moran 2014 (20) | Adults with acute MI | | Incidence of acute MI is 3 times as common in emergencies (21-25) |
| Moran 2014 (20) | | Adults with coronary disease | |
| Feigin 2014 (26) | Adults with acute stroke | | Incidence of stroke is 2 times as common in emergencies (21-25) |
| Feigin 2014 (26) | | Adults with cerebrovascular disease | |

| Citation | Incidence of acute presentation | Prevalence of chronic presentation | Note |
|---|--|---|------|
| Blecker 2014 (27) Moran 2014 (20) Akinbami 2011 (28) Akinbami 2011 (28) Burney 2015 (29) Centers for Disease Control and Prevention (30) Hurst 2010 (31) Buist 2007 (32) | Adults with heart failure Adults with asthma attacks Children with asthma attacks Adults with COPD exacerbation | Adults with heart failure Adults with asthma Children with asthma Adults with COPD | |

Population estimates (total and distribution of adults and children) were drawn from the United Nations' Department of Economic and Social Affairs Population Division, the 2013 Revision (esa.un.org/unpd/wpp/Download/Standard/Population).

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