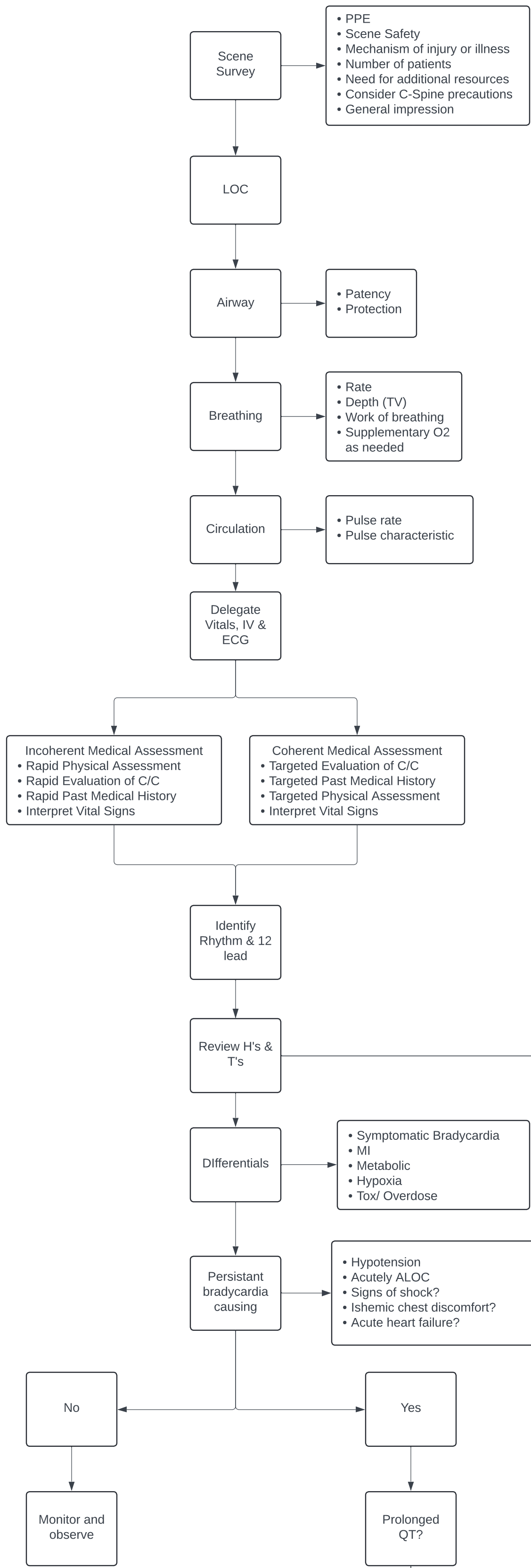
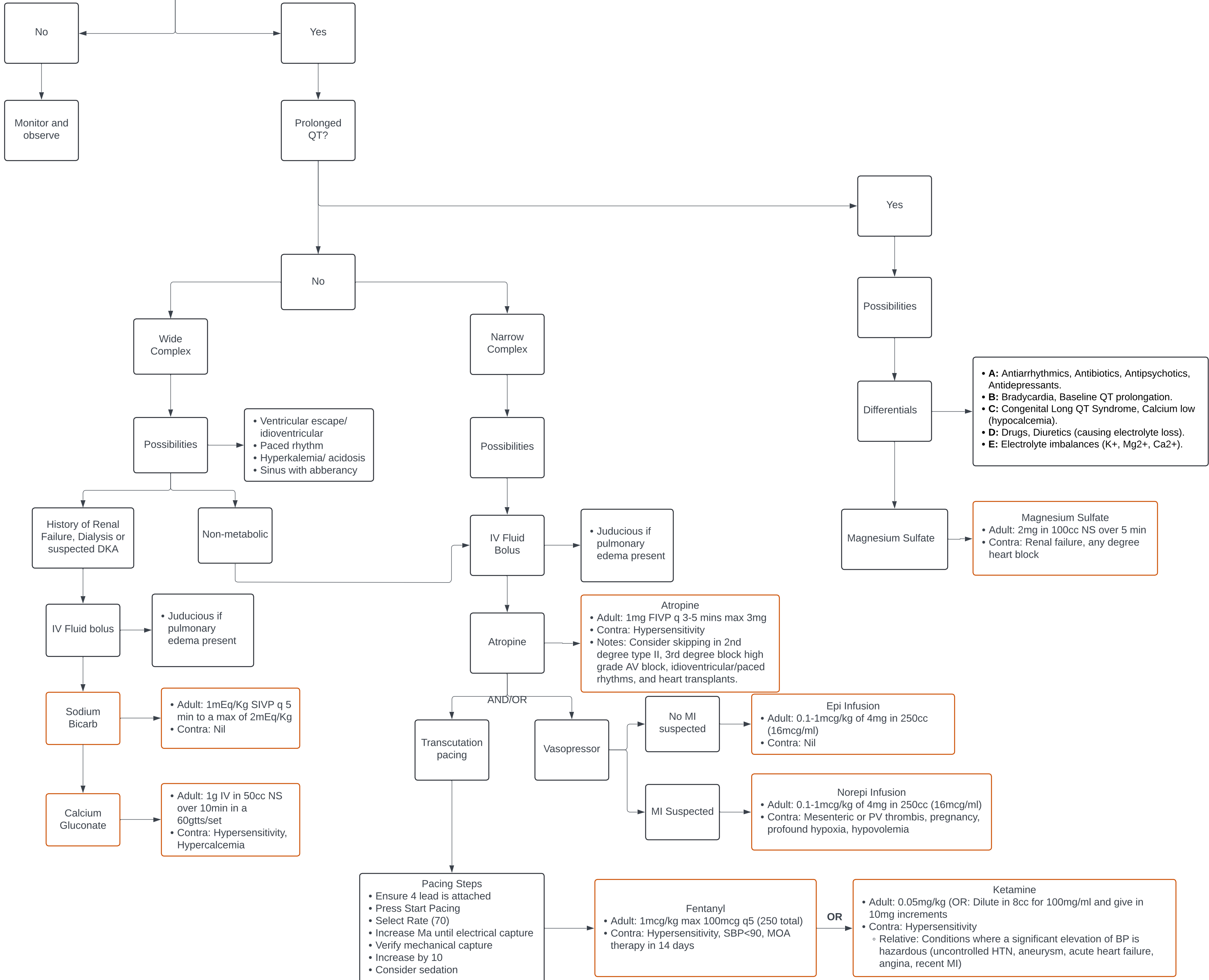


Symptomatic Bradycardia



H's and T's (ACLS Reversible Causes)			
Condition	Common associated clinical settings / Hx. (Up to Date - Treatable conditions associated with cardiac arrest)	Pre-Cardiac Arrest findings (i.e. cardiac arrest findings)	Cardiac Arrest findings
Hypoxia	Upper airway obstruction, hypoventilation (CNS dysfunction, neuromuscular disease), pulmonary disease	*Abnormal lung sounds, ↓ MV with ↑ CO2 and ↓ SpO2	*Abnormal breath sounds
Hypovolemia (fluid losses)	Significant burns, diabetes, gastrointestinal losses, malignancy, sepsis	Compensated shock (↑ HR, ↓ BP)	↓ CVP
Hypovolemia (Anemia)	Gastrointestinal bleeding, nutritional deficiencies, recent trauma	Compensated shock (↑ HR, ↓ BP), conjunctival pallor	↓ CVP
Hydrogen Ions (Acidosis)	DKA, diarrhea, drug overdose, renal dysfunction, sepsis, shock	Respiratory compensation (T/MV, ↑ HR)	Adequate Ma, NatHCO3
Hyperkalemia	Severe metabolic acidosis (see above), hemolysis, rhabdomyolysis, major soft tissue injury, tumor lysis syndrome, excessive potassium intake	ECG changes: peaked T, Prolonged PR interval, AV blocks, brady arrhythmias, wide QRS widening, ...	Adequate Ma, NatHCO3, Calcium gluconate
Hypokalemia	Alcohol abuse, diabetes mellitus, diuretics, drug overdose, profound gastrointestinal losses	ECG changes: Prolonged PR interval, ST depression and T wave flattening / inversion, prominent U waves, long QT interval due to fusion of T and U waves	Rapid Transfer for assessment of potassium levels
Hypothermia	Alcohol intoxication, significant burns, drowning, drug overdose, elder patient, endocrine disease, environmental exposure, spinal cord disease, trauma	Hypothermic (Mild 32-35°C, Moderate 28-32°C) ECG changes: bradyarrhythmia, Osborne waves, PNCs	Hypothermic (< 29 °C)
Toxins (Poisoning)	History of alcohol or drug abuse, altered mental status, classic toxidrome (eg. sympathomimetic), occupational exposure, psychiatric disease	See BCSS - Toxidrome Chart Below	Specific treatment / antidotes
Tamponade - cardiac	Post-cardiac surgery, malignancy, post-myocardial infarction, pericarditis, trauma	JVD, muffled heart sounds, ECG may + low voltage, or electrical alternans	↑ CVP
Tension pneumothorax	Central venous catheter, mechanical ventilation, pulmonary disease (eg. asthma, chronic obstructive pulmonary disease), recent thoracostomy, thoracic trauma	High tracheal pressure, JVD, asymmetric lung sounds / cx rise	↑ CVP
Thrombosis - Pulmonary embolism	Immobolized patient, recent surgical procedure (eg. orthopedic), peripartum, risk factors for thromboembolic disease, recent trauma, presentation consistent with acute pulmonary embolism	DVT, Unexplained hypoxemia, sudden onset pleuritic cx pain and SOB, lower ext. swelling (DVT), ↑ CVP	ECG, OMC consult re thrombolytics or Rapid transport
Thrombosis - Coronary (MI)	Cardiac arrest	ECG changes: Sinus brn (44%), RBBB (16%), R axis (16 %), Complete R wave in V1, P pulmonal (9%), ST QMI TMI pattern (25%), atrial arrhythmias (8 %), Non-specific ST segment and T wave changes, including ST elevation and depression (25%)	ECG, OMC consult re thrombolytics or Rapid transport to cath lab

(MacLeod, 2024d)



References

- AHS protocols. (2024, August 8). <https://www.ahs.org/public/protocols/templates/desktop/#home>
- MacLeod, M. H. (2024d). ACLS Reversible Causes – H's & T's.
- Salih, M. (2022, June 13). Drug-induced QTc prolongation. Drug-Induced QTc Prolongation - Internal Medicine Residency Handbook. <https://vim-book.org/toxicology/toxicology-qtc/>

norepinephrine OR Epinephrine Infusion																
Concentration: 4 mg in 250 mL of D5W or normal saline = 16 mcg/mL																
	Weight (kg)															
Dose (mcg/kg/min)	40	45	50	55	60	65	70	75	80	85	90	100	110	120		
0.1 <td>15</td> <td>16.9</td> <td>18.8</td> <td>20.6</td> <td>22.5</td> <td>24.4</td> <td>26.3</td> <td>28.1</td> <td>30</td> <td>31.9</td> <td>33.8</td> <td>35.5</td> <td>41.3</td> <td>45</td> <td></td> <td></td>	15	16.9	18.8	20.6	22.5	24.4	26.3	28.1	30	31.9	33.8	35.5	41.3	45		
0.15	22.5	25.3	28.1	30.9	34	36.8	39.4	42.2	45	47.8	50.6	53.3	61.9	67.5		
0.2 <td>30</td> <td>33.8</td> <td>37.5</td> <td>41.3</td> <td>45</td> <td>48.8</td> <td>52.5</td> <td>56.3</td> <td>60</td> <td>63.8</td> <td>67.5</td> <td>71.3</td> <td>82.5</td> <td>90</td> <td></td> <td></td>	30	33.8	37.5	41.3	45	48.8	52.5	56.3	60	63.8	67.5	71.3	82.5	90		
0.25 <td>37.5</td> <td>42.2</td> <td>46.9</td> <td>51.6</td> <td>56</td> <td>60.9</td> <td>65.6</td> <td>70.3</td> <td>75</td> <td>79.7</td> <td>84.4</td> <td>89.1</td> <td>103.1</td> <td>112.5</td> <td></td> <td></td>	37.5	42.2	46.9	51.6	56	60.9	65.6	70.3	75	79.7	84.4	89.1	103.1	112.5		
0.3 <td>45</td> <td>50.6</td> <td>56.3</td> <td>61.9</td> <td>68</td> <td>73.1</td> <td>78.8</td> <td>84.4</td> <td>90</td> <td>95.6</td> <td>101.3</td> <td>107</td> <td>123.8</td> <td>135</td> <td></td> <td></td>	45	50.6	56.3	61.9	68	73.1	78.8	84.4	90	95.6	101.3	107	123.8	135		
0.35 <td>52.5</td> <td>59.1</td> <td>65.6</td> <td>72.2</td> <td>79</td> <td>85.3</td> <td>91.9</td> <td>98.4</td> <td>105</td> <td>111.6</td> <td>118.1</td> <td>124.6</td> <td>144.4</td> <td>157.5</td> <td></td> <td></td>	52.5	59.1	65.6	72.2	79	85.3	91.9	98.4	105	111.6	118.1	124.6	144.4	157.5		
0.4 <td>60</td> <td>67.5</td> <td>75</td> <td>82.5</td> <td>90</td> <td>97.5</td> <td>105</td> <td>112.5</td> <td>120</td> <td>127.5</td> <td>135</td> <td>142.5</td> <td>165</td> <td>180</td> <td></td> <td></td>	60	67.5	75	82.5	90	97.5	105	112.5	120	127.5	135	142.5	165	180		
0.45 <td>67.5</td> <td>75.9</td> <td>84.4</td> <td>92.9</td> <td>101</td> <td>109.7</td> <td>118.1</td> <td>126.6</td> <td>135</td> <td>143.4</td> <td>151.9</td> <td>160.4</td> <td>185.6</td> <td>202.5</td> <td></td> <td></td>	67.5	75.9	84.4	92.9	101	109.7	118.1	126.6	135	143.4	151.9	160.4	185.6	202.5		
0.5 <td>75</td> <td>84.4</td> <td>93.8</td> <td>103.1</td> <td>113</td> <td>121.9</td> <td>131.3</td> <td>140.6</td> <td>150</td> <td>159.4</td> <td>168.8</td> <td>178.1</td> <td>206.3</td> <td>225</td> <td></td> <td></td>	75	84.4	93.8	103.1	113	121.9	131.3	140.6	150	159.4	168.8	178.1	206.3	225		
0.55 <td>82.5</td> <td>92.8</td> <td>103.1</td> <td>113.4</td> <td>124</td> <td>134.1</td> <td>144.4</td> <td>154.7</td> <td>165</td> <td>175.3</td> <td>185.6</td> <td>195.9</td> <td>228.9</td> <td>247.5</td> <td></td> <td></td>	82.5	92.8	103.1	113.4	124	134.1	144.4	154.7	165	175.3	185.6	195.9	228.9	247.5		
0.6 <td>90</td> <td>101.3</td> <td>112.5</td> <td>123.8</td> <td>135</td> <td>146.3</td> <td>157.5</td> <td>168.8</td> <td>180</td> <td>191.3</td> <td>202.5</td> <td>213.8</td> <td>247.5</td> <td>270</td> <td></td> <td></td>	90	101.3	112.5	123.8	135	146.3	157.5	168.8	180	191.3	202.5	213.8	247.5	270		
0.65 <td>97.5<td>109.7</td><td>121.9</td><td>134</td><td>146</td><td>158.4</td><td>170.6</td><td>182.8</td><td>195</td><td>207.2</td><td>219.4</td><td>231.6</td><td>268.1</td><td>292.5</td><td></td><td></td></td>	97.5 <td>109.7</td> <td>121.9</td> <td>134</td> <td>146</td> <td>158.4</td> <td>170.6</td> <td>182.8</td> <td>195</td> <td>207.2</td> <td>219.4</td> <td>231.6</td> <td>268.1</td> <td>292.5</td> <td></td> <td></td>	109.7	121.9	134	146	158.4	170.6	182.8	195	207.2	219.4	231.6	268.1	292.5		
0.7 <td>105</td> <td>118.1</td> <td>131.3</td> <td>144.4</td> <td>158</td> <td>170.6</td> <td>183.3</td> <td>196.9</td> <td>210</td> <td>223.1</td> <td>236.3</td> <td>249.5</td> <td>288.8</td> <td>315</td> <td></td> <td></td>	105	118.1	131.3	144.4	158	170.6	183.3	196.9	210	223.1	236.3	249.5	288.8	315		
0.75 <td>112.5</td> <td>126.6</td> <td>140.6</td> <td>154.7</td> <td>169</td> <td>182.8</td> <td>196.9</td> <td>210.9</td> <td>225</td> <td>239.1</td> <td>253.1</td> <td>267.1</td> <td>309.4</td> <td>337.5</td> <td></td> <td></td>	112.5	126.6	140.6	154.7	169	182.8	196.9	210.9	225	239.1	253.1	267.1	309.4	337.5		
0.8 <td>120</td> <td>135</td> <td>150</td> <td>165</td> <td>180</td> <td>195</td> <td>210</td> <td>225</td> <td>240</td> <td>255</td> <td>270</td> <td>285</td> <td>330</td> <td>360</td> <td></td> <td></td>	120	135	150	165	180	195	210	225	240	255	270	285	330	360		
0.85 <td>127.5</td> <td>143.4</td> <td>159.4</td> <td>175.3</td> <td>191</td> <td>207.2</td> <td>223.1</td> <td>239.1</td> <td>255</td> <td>270.9</td> <td>286.9</td> <td>302.9</td> <td>350.6</td> <td>382.5</td> <td></td> <td></td>	127.5	143.4	159.4	175.3	191	207.2	223.1	239.1	255	270.9	286.9	302.9	350.6	382.5		
0.9 <td>135</td> <td>151.9</td> <td>168.8</td> <td>185.6</td> <td>203</td> <td>219.4</td> <td>236.3</td> <td>253.1</td> <td>270</td> <td>286.9</td> <td>303.8</td> <td>320.7</td> <td>371.3</td> <td>405</td> <td></td> <td></td>	135	151.9	168.8	185.6	203	219.4	236.3	253.1	270	286.9	303.8	320.7	371.3	405		
0.95 <td>142.5</td> <td>160.3</td> <td>178.1</td> <td>195.9</td> <td>214</td> <td>231.6</td> <td>249.4</td> <td>267.2</td> <td>285</td> <td>302.8</td> <td>320.6</td> <td>338.4</td> <td>391.9</td> <td>427.5</td> <td></td> <td></td>	142.5	160.3	178.1	195.9	214	231.6	249.4	267.2	285	302.8	320.6	338.4	391.9	427.5		
1 <td>150</td> <td>168.8</td> <td>187.5</td> <td>206.3</td> <td>225</td> <td>243.8</td> <td>262.5</td> <td>281.3</td> <td>300</td> <td>319</td> <td>337.5</td> <td>356.3</td> <td>412.5</td> <td>450</td> <td></td> <td></td>	150	168.8	187.5	206.3	225	243.8	262.5	281.3	300	319	337.5	356.3	412.5	450		
	Rate (mL/hr)															

(AHS protocols, 2024)