**Supplemental Table 1.** Scoring tools predictive of massive transfusion protocol activation and transfusions with associated prehospital applicability.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Scoring Tool** | **Variables** | **Applicability** | **Citation** | **Prediction Variable** | **Sensitivity**  **(95% CI)** | **Specificity**  **(95% CI)** | **AUROC**  **(95% CI)** |
| 1 | Shock Index (SI) | HR, SBP | Applicable | Schroll et al, 201840 | MTP | 68% (50-83%) | 81% (78-84%) | 0.83 (n/a) |
|  |  |  |  | Paladino et al, 201141 | MTP | 24% (19-30%) | 92% (90-93%) | 0.63 (0.59-0.67) |
|  |  |  |  | Mitra et al, 201442 | MTP | 48% (41-55%) | 91% (89-92%) | n/a (n/a) |
|  |  |  |  | El-Menyar et al, 201843 | MTP | 85% (n/a) | 64% (n/a) | 0.82 (0.77-0.86) |
|  |  |  |  | Terceros-Almanza et al, 201944 | MTP | 96% (n/a) | 36% (n/a) | 0.77 (0.74-0.81) |
|  |  |  |  | Terceros-Almanza et al, 201745 | MTP | 91% (73-98%) | 80% (74-84%) | 0.89 (0.84-0.94) |
|  |  |  |  | David et al, 201731 | MTP | 94% (n/a) | 71% (n/a) | n/a (n/a) |
|  |  |  |  | Zhu et al, 201936 | MTP | 67% (n/a) | 43% (n/a) | n/a (n/a) |
|  |  |  |  | Marenco et al, 202046 | MTP | 88% (n/a) | 78% (n/a) | n/a (n/a) |
|  |  |  |  | Zarzaur et al, 200847 | Transfusion | n/a (n/a) | n/a (n/a) | 0.78 (0.77-0.80) |
|  |  |  |  | Ozakin et al, 202037 | Transfusion | n/a (n/a) | n/a (n/a) | 0.73 (n/a) |
|  |  |  |  | Day et al, 201648 | Transfusion | n/a (n/a) | n/a (n/a) | n/a (n/a) |
|  |  |  |  | Mitra et al, 2014 | Transfusion | 43% (38-49%) | 91% (89-92%) | n/a (n/a) |
| 2 | Shock Volume | Shock index over multiple time-points | Applicable | McKinley et al, 201949 | MTP at 6h | 85% (n/a) | 82% (n/a) | 0.90 (0.83-0.98) |
|  |  |  |  | McKinley et al, 2019 | MTP at 12h | 92% (n/a) | 94% (n/a) | 0.92 (0.85-0.99) |
| 3 | Modified SI (MSI) | HR, mean arterial BP | Applicable | Terceros-Almanza et al, 2017 | MTP | 96% (79-99%) | 76% (70-81%) | 0.90 (0.86-0.95) |
| 4 | SI x Age | HR, SBP, age | Applicable | Zarzaur et al, 2008 | Transfusion | n/a (n/a) | n/a (n/a) | 0.76 (0.74-0.78) |
| 5 | Prehospital SI | HR, SBP in prehospital stage | Applicable | Campion et al, 202026 | MTP | n/a (n/a) | n/a (n/a) | 0.62 (0.49-0.75) |
|  |  |  |  | Wang et al, 202050 | MTP | 91% (n/a) | 65% (n/a) | 0.77 (0.75-0.80) |
|  |  |  |  | Pottecher et al, 201651 | MTPa | n/a (n/a) | n/a (n/a) | 0.80 (0.74-0.87) |
|  |  |  |  | Pottecher et al, 2016 | MTPb | n/a (n/a) | n/a (n/a) | 0.72 (0.68-0.77) |
|  |  |  |  | Jehan et al, 201927 | MTP | n/a (n/a) | n/a (n/a) | 0.81 (n/a) |
|  |  |  |  | Wang et al, 2020 | Transfusion at 4h | 48% (n/a) | 83% (n/a) | 0.69 (0.66-0.72) |
|  |  |  |  | Wang et al, 2020 | Transfusion at 24h | 42% (n/a) | 84% (n/a) | 0.66 (0.63-0.69) |
|  |  |  |  | Wang et al, 2020 | Transfusion at 4h | 69% (n/a) | 62% (n/a) | 0.68 (0.65-0.71) |
| 6 | Prehospital MSI | HR/MAP in prehospital stage | Applicable | Wang et al, 2020 | MTP | 60% (n/a) | 82% (n/a) | 0.77 (0.74-0.79) |
|  |  |  |  | Wang et al, 2020 | Transfusion at 24h | 64% (n/a) | 62% (n/a) | 0.65 (0.62-0.68) |
| 7 | Shock index pediatric age adjusted (SIPA)/SI x age | HR, SBP, age | Applicable | Marenco et al, 2020 | Transfusion | 61% (n/a) | 66% (n/a) | n/a (n/a) |
|  |  |  |  | Acker et al, 201652 | Transfusion | 58% (n/a) | 84% (n/a) | n/a (n/a) |
| 8 | Prehospital SIPA | HR, SBP, age | Applicable | Phillips et al, 202053 | Transfusion | n/a (n/a) | n/a (n/a) | 0.74 (0.63-0.85) |
| 9 | ED SIPA | HR, SBP, age | Applicable | Phillips et al, 202053 | Transfusion | n/a (n/a) | n/a (n/a) | 0.86 (0.77-0.94) |
| 10 | Prehospital Index | SBP, HR, RR, level of consciousness | Applicable | Jone et al, 199354 | Transfusion | 78% (66-86%) | 98% (96-99%) | 0.92 (n/a) |
| 11 | Trauma Induced Coagulopathy Clinical Score (TICCS)/Modified TICCS | General severity of trauma, SBP, extent of significant injuries | Applicable | Horst et al, 202055 | MTP | 78% (62-89%) | 74% (70-78%) | 0.78 (0.74-0.81) |
|  |  |  |  | Swerts et al, 201956 | Transfusion | n/a (n/a) | n/a (n/a) | n/a (n/a) |
|  |  |  |  | Tonglet et al, 201757 | Transfusion | n/a (n/a) | n/a (n/a) | 0.70 (0.69-0.71) |
| 12 | Pre-hospital Code Red Bleeding Protocol | Suspected or confirmed bleeding, SBP, patient unresponsive to fluid bolus | Applicable | Reed et al, 201728 | Transfusion | 89% (n/a) | n/a (n/a) | n/a (n/a) |
| 13 | Extremity/Mechanism/Shock Index/GCS (EMS-G) Score | Obvious extremity injury, penetrating mechanisms, SI, GCS | Applicable | Kovar et al, 201958 | MTP | 89% (72-90%) | 84% (78-89%) | 0.87 (0.80-0.93) |
|  |  |  |  | Kovar et al, 2019 | MTP | 96% (82-100%) | 66% (59-72%) | 0.81 (0.76-0.86) |
| 14 | PP and SI | PP, HR, SBP | Applicable | Zhu et al, 2019 | MTP | 61% (n/a) | 68% (n/a) | n/a (n/a) |
| 15 | Mechanism of Injury, Glasgow Coma Scale, Age, and Arterial Pressure (MGAP) Score | Mechanism, GCS, age, SBP | Applicable | David et al, 2017 | MTP | 86% (n/a) | 54% (n/a) | n/a (n/a) |
| 16 | Revised Trauma Score (RTS) | GCS, SBP, RR | Applicable | Ozakin et al, 2020 | Transfusion | n/a (n/a) | n/a (n/a) | 0.86 (n/a) |
| 17 | Pre-arrival Model by Hwu et al. | HR, temperature, GCS, penetrating injury | Applicable | Hwu et al, 201859 | MTP | 87% (n/a) | 95% (n/a) | 0.97 (0.92-1.00) |
| 18 | Prehospital Pulse Pressure/Heart Rate Ratio | PP, HR (prehospital) | Applicable | Pottecher et al, 2016 | MTPa | n/a (n/a) | n/a (n/a) | 0.77 (0.70-0.84) |
|  |  |  |  | Pottecher et al, 2016 | MTPb | n/a (n/a) | n/a (n/a) | 0.71 (0.67-0.76) |
| 19 | Injury Severity Score (ISS) | Worst head and neck injury, worst face injury, worst chest injury, worst abdominal injury, worst extremity (incl. pelvis) injury, worst external injury | Applicable | David et al, 2017 | MTP | 61% (n/a) | 89% (n/a) | n/a (n/a) |
| 20 | Class-4 Hemorrhage Unresponsive to Lactated Ringer (CHULA) | Clinical signs of Class-4 hemorrhage, not responsive to 1-2L of Lactated Ringer’s bolus, and suspected ongoing bleeding | Applicable | Prichayudh et al, 201960 | MTP | 94% (86-98%) | 90% (86-94%) | n/a (n/a) |
| 21 | ABC | Penetrating mechanism, systolic BP ≤ 90 mmHg in the ED, HR ≥ 120 in the ED, positive FAST | Potentially | Prichayudh et al, 2019 | MTP | 63% (51-74%) | 79% (74-84%) | n/a (n/a) |
|  |  |  |  | Schroll et al, 2018 | MTP | 47% (30-65%) | 90% (87-92%) | 0.74 (n/a) |
|  |  |  |  | Brockamp et al, 201261 | MTP | 76% (n/a) | 70% (n/a) | 0.76 (0.73-0.79) |
|  |  |  |  | Horst et al, 2020 | MTP | 60% (43-75%) | 75% (70-79%) | 0.68 (0.64-0.73) |
|  |  |  |  | Chaochankit et al, 201862 | MTP | 81% (n/a) | 34% (n/a) | 0.57 (n/a) |
|  |  |  |  | Cotton et al, 201063 | MTP | 76-90% (n/a) | 67-88% (n/a) | 0.83-0.90 (n/a) |
|  |  |  |  | Hanna et al, 202064 | MTP | 69% (n/a) | 82% (n/a) | 0.72 (0.68-0.76) |
|  |  |  |  | Joseph et al, 201865 | MTP | 39% (n/a) | 72% (n/a) | 0.62 (0.55-0.68) |
|  |  |  |  | Krumrei et al, 201266 | MTP | 89% (n/a) | 85% (n/a) | 0.86 (n/a) |
|  |  |  |  | Nunez et al, 200967 | MTP | 75% (n/a) | 86% (n/a) | 0.84 (n/a) |
|  |  |  |  | Motameni et al, 201868 | MTP | n/a (n/a) | n/a (n/a) | n/a (n/a) |
|  |  |  |  | Mitra et al, 201269 | MTP | 46% (43-48%) | 94% (93-95%) | 0.78 (n/a) |
|  |  |  |  | Ohmori et al, 201770 | MTP | 73% (n/a) | 80% (n/a) | 0.79 (0.72-0.86) |
|  |  |  |  | Boutefnouchet et al, 201571 | MTP | n/a (n/a) | n/a (n/a) | 0.81 (0.72-0.87) |
|  |  |  |  | Terceros-Almanza et al, 2019 | MTP | 80% (n/a) | 43% (n/a) | 0.68 (0.61-0.75) |
|  |  |  |  | Ogura et al, 201472 | MTP | 79% (n/a) | 78% (n/a) | 0.81 (n/a) |
|  |  |  |  | Phillips et al, 202011 | Transfusion | 78% (n/a) | 55% (n/a) | n/a (n/a) |
|  |  |  |  | Acker et al, 2016 | Transfusion | 65% (n/a) | 84% (n/a) | n/a (n/a) |
| 22 | ABC-S | ABC with age-adjusted shock index (SIPA) | Potentially | Phillips et al, 202011 | Transfusion | 72% (n/a) | 47% (n/a) | n/a (n/a) |
|  |  |  |  | Acker et al, 2016 | Transfusion | 65% (n/a) | 84% (n/a) | n/a (n/a) |
| 23 | ABCD + base deficit | ABC, SIPA, base deficit | Potentially | Phillips et al, 202011 | Transfusion | 84% (n/a) | 57% (n/a) | 0.79 (0.73-0.85) |
| 24 | ABCD + lactate | ABC, SIPA, lactate | Potentially | Chaochankit et al, 2018 | MTP | 92% (n/a) | 42% (n/a) | 0.745 (n/a) |
|  |  |  |  | Phillips et al, 202011 | Transfusion | 77% (n/a) | 53% (n/a) | 0.68 (0.61-0.76) |
| 25 | ABCD + base deficit + lactate | ABC, SIPA, base deficit, lactate | Potentially | Phillips et al, 202011 | Transfusion | 87% (n/a) | 53% (n/a) | 0.81 (0.75-0.86) |
| 26 | Traumatic Bleeding Severity Score (TBSS) | Age, SBP, FAST, pelvic fracture severity, serum lactate | Potentially | Ogura et al, 201573 | MTP | 97% (90-99%) | 70% (63-77%) | 0.97 (0.94-0.99) |
|  |  |  |  | Ogura et al, 2015 | MTP | 80% (70-88%) | 98% (94-99%) | 0.97 (0.94-0.99) |
|  |  |  |  | Ogura et al, 2014 | MTP | 97% (n/a) | 96% (n/a) | 0.99 (n/a) |
|  |  |  |  | Ogura et al, 201674 | MTP | 93% (n/a) | 92% (n/a) | 0.96 (0.93-0.98) |
| 27 | MTPitt | Sex, SBP, HR, GCS, RR, FAST, mechanism of injury (blunt vs. penetrating), open or dislocated femur fracture or unstable pelvic fracture | Potentially | Seheult et al, 201975 | MTP | 87% (60-98%) | 76% (69-82%) | n/a (n/a) |
| 28 | MTPitt+Labs | Sex, SBP, HR, GCS, RR, FAST, mechanism of injury (blunt vs. penetrating), open or dislocated femur fracture or unstable pelvic fracture, Hb, INR, pH, base deficit | Potentially | Seheult et al, 2019 | MTP | 87% (60-98%) | 88% (83-92%) | n/a (n/a) |
| 29 | Scoring System by Mackenzie et al. | Age, gender, prehospital SI, PPG waveform, SpO2s, HR | Potentially | Mackenzie et al, 201476 | MTP | 78% (n/a) | 71% (n/a) | 0.82 (0.74-0.90) |
|  |  |  |  | Mackenzie et al, 2014 | Transfusion | 86% (n/a) | 72% (n/a) | 0.78 (0.69-0.87) |
| 30 | Red Flag binary alert | SI>/=1, MAP </= 70mmHg, point of care Hb </= 13g/dl, unstable pelvis and pre-hospital intubation | Potentially | Hamada et al, 201877 | Transfusion | 75% (72-79%) | 79% (77-80%) | 0.83 (0.81-0.84) |
| 31 | Trauma Associated Severe Hemorrhage (TASH) | SBP, gender, Hb, FAST, HR, BE and fracture of the pelvis or femur | Potentially | Horst et al, 2020 | MTP | 68% (51-81%) | 82% (78-86%) | 0.78 (0.74-0.82) |
|  |  |  |  | Brockamp et al, 2012 | MTP | 84% (n/a) | 78% (n/a) | 0.89 (0.87-0.91) |
|  |  |  |  | DeJong et al, 201678 | MTP | 89% (81-95%) | 86% (83-88%) | 0.94 (0.92-0.95) |
|  |  |  |  | Maegele et al, 201179 | MTP | 31% (n/a) | 98% (n/a) | 0.91 (0.89-0.92) |
|  |  |  |  | Terceros-Almanza et al, 2019 | MTP | 93% (n/a) | 62% (n/a) | 0.82 (0.74-0.88) |
|  |  |  |  | Boutefnouchet et al, 2015 | MTP | n/a (n/a) | n/a (n/a) | 0.88 (0.81-0.93) |
|  |  |  |  | Ogura et al, 2016 | MTP | 87% (n/a) | 83.60% (n/a) | 0.91 (0.87-0.94) |
|  |  |  |  | Lui et al, 201880 | MTP | 13% (7-22%) | 99% (99-99%) | 0.87 (0.83-0.91) |
|  |  |  |  | Krumrei et al, 2012 | MTP | 3% (n/a) | 99.70% (n/a) | 0.51 (n/a) |
|  |  |  |  | Nunez et al, 2009 | MTP | n/a (n/a) | n/a (n/a) | 0.84 (n/a) |
|  |  |  |  | Yucel et al, 200681 | MTP | n/a (n/a) | n/a (n/a) | 0.89 (n/a) |
|  |  |  |  | Ogura et al, 2014 | MTP | 82% (n/a) | 78.2% (n/a) | 0.89 (n/a) |
|  |  |  |  | Mitra et al, 2012 | MTP | 25% (23-28%) | 100% (99-100%) | 0.90 (n/a) |
|  |  |  |  | Ohmori et al, 2017 | MTP | 81% (n/a) | 80% (n/a) | 0.88 (0.83-0.93) |
| 32 | McLaughlin | HR, SBP, pH, hematocrit | Potentially | Krumrei et al, 2012 | MTP | 16% (n/a) | 98% (n/a) | 0.56 (n/a) |
|  |  |  |  | Nunez et al, 2009 | MTP | n/a (n/a) | n/a (n/a) | 0.85 (n/a) |
|  |  |  |  | McLaughlin et al, 200882 | MTP | 59% (n/a) | 77% (n/a) | 0.75 (n/a) |
| 33 | TICCS.BE (Base Excess) | General severity of trauma, SBP, extent of significant injuries, BE, FAST | Potentially | Swerts et al, 2019 | Transfusion | 100% (54-100%) | 96% (88-99%) | 0.70 (0.69-0.71) |
| 34 | Phone App | Intercept, BD, mechanism (GSW vs. stab wound vs blunt injury), HR, SBP | Potentially | Hodgman et al, 201883 | MTP | n/a (n/a) | n/a (n/a) | 0.69 (n/a) |
| 35 | FASILA Score | FAST, SI, lactate | Potentially | El-Menyar et al, 202084 | MTP | 42% (n/a) | 97% (n/a) | 0.87 (0.84-0.90) |
|  |  |  |  | El-Menyar et al, 2020 | Transfusion | 68% (n/a) | 89% (n/a) | 0.81 (0.78-0.84) |
| 36 | Revised Assessment of Bleeding and Transfusion (RABT) | SI, pelvic fracture, FAST, penetrating mechanism | Potentially | Joseph et al, 2018 | MTP | 84% (n/a) | 77% (n/a) | 0.83 (0.78-0.87) |
|  |  |  |  | Hanna et al, 2020 | MTP | 78% (n/a) | 91% (n/a) | 0.89 (0.86-0.91) |
| 37 | Prince of Wales/Rainer Score | HR, SBP, GCS, pelvic fracture, free abdominal fluid (FAST or CT), BE, Hb | Potentially | Horst et al, 2020 | MTP | 78% (62-89%) | 52% (47-57%) | 0.65 (0.60-0.69) |
|  |  |  |  | Terceros-Almanza et al, 2019 | MTP | 93% (n/a) | 61% (n/a) | 0.82 (0.74-0.88) |
|  |  |  |  | Lui et al, 2018 | MTP | 3.4% (0.9-10%) | 99% (98-99%) | 0.84 (0.80-0.89) |
|  |  |  |  | Mitra et al, 2012 | MTP | 37% (34-40%) | 97% (96-98%) | 0.84 (n/a) |
|  |  |  |  | Ohmori et al, 2017 | MTP | 80% (n/a) | 80% (n/a) | 0.86 (0.81-0.91) |
| 38 | Scoring System by Rainer et al. | SBP, GCS, HR, displaced pelvic fracture, CT scan or FAST positive, BD, Hb | Potentially | Rainer et al, 201185 | MTP | 32% (22-42%) | 100% (99-100%) | 0.89 (n/a) |
|  |  |  |  | Brockamp et al, 2012 | MTP | 81% (n/a) | 78% (n/a) | 0.86 (0.84-0.88) |
| 39 | Milano Score | GCS, TXA, penetrating trauma, hemothorax, pelvic fracture, FAST, HR, SBP, PTT, limb amputation | Potentially | Cornero et al, 202086 | MTP | n/a (n/a) | n/a (n/a) | 0.85 (n/a) |
| 40 | Dynamic Massive Blood Transfusion (DMBT) Score | SBP, HR, Hb, INR, BD, unstable pelvic fracture, hemoperitoneum on imaging | Potentially | Lui et al, 2018 | MTP | 78% (68-89%) | 88% (87-89%) | 0.91 (0.88-0.94) |
| 41 | Vandromme Score | Lactate, HR, INR, Hb, SBP | Potentially | Brockamp et al, 2012 | MTP | 79% (n/a) | 76% (n/a) | 0.84 (0.82-0.86) |
| 42 | Schreiber Score | Hb, INR, penetrating mechanism | Potentially | Brockamp et al, 2012 | MTP | 86% (n/a) | 62% (n/a) | 0.80 (0.77-0.83) |
| 43 | Larson Score | SBP, HR, Hb, BE | Potentially | Horst et al, 2020 | MTP | 55% (39-71%) | 80% (75-83%) | 0.74 (0.70-0.78) |
|  |  |  |  | Terceros-Almanza et al, 2019 | MTP | 77% (n/a) | 77% (n/a) | 0.81 (0.77-0.85) |
|  |  |  |  | Brockamp et al, 2012 | MTP | 71% (n/a) | 80% (n/a) | 0.82 (0.80-0.85) |
| 44 | Mobile Application Modeling | Complex formula using mobile application, with included variables being SBP, HR, base deficit | Potentially | Mina et al, 201687 | MTP | n/a (n/a) | n/a (n/a) | 0.96 (n/a) |
| 45 | Yumoto Screening Method | SI, BE, FAST | Potentially | Yumoto et al, 201488 | MTP | 97% (n/a) | 81% (n/a) | 0.93 (0.89-0.98) |
| 46 | Canadian Bleeding (CAN-BLEED) score | SBP, clinical examination findings suggestive of hemorrhage, lactate, FAST, free fluid or contrast extravasation on computed tomography | Not applicable | Tran et al, 202089 | MTP | 98% (94-100%) | 73% (70-76%) | n/a (n/a) |
| 47 | Emergency Transfusion Score (ETS) | SBP, FAST, clinical pelvic instability, age, admission from trauma scene, mechanism of injury | Not applicable | Horst et al, 2020 | MTP | 80% (64-91%) | 53% (48-58%) | 0.71 (0.67-0.75) |
|  |  |  |  | Terceros-Almanza et al, 2019 | MTP | 95% (n/a) | 61% (n/a) | 0.85 (0.79-0.90) |
| 48 | Coagulopathy in Severe Trauma (COAST) Score | Long on-scene time or total prehospital time from injury to ED arrival, prehospital SBP, temperature on ED arrival, prehospital thorax drain (i.e., prehospital chest decompression), abdominal abbreviate injury scale | Not applicable | Thorn et al, 201990 | Acute traumatic coagulopathy | 22% (n/a) | 94% (n/a) | 0.63 (0.61-0.64) |
| 49 | Modified TBSS | Age, SBP on arrival to ED, FAST, pelvic fracture severity, lactate | Not applicable | Ogura et al, 2016 | MTP | 80% (n/a) | 91% (n/a) | 0.92 (0.89-0.96) |
| 50 | Military Acute Severe Haemorrhage (MASH) Score | Number of amputated limbs, number of femoral fractures (open/closed), number of open tibial fractures, severe pelvic injury, severe arterial bleed, hemothorax (on CXR), FAST, HR, SBP, RR, prehospital blood products administered, prehospital or ED tourniquet applied to control bleeding, prehospital or ED hemostatic agent required to control bleeding | Not applicable | McLennan et al, 201891 | MTP | 86% (73-94%) | 89% (87-91%) | 0.93 (0.91-0.95) |
| 51 | Novel Predictive Score of Massive Hemorrhage in Pelvic Ring Fractures | Lactate, AO/OTA classification, pelvic extravasation on CT | Not applicable | Ohmori et al, 201692 | Transfusion | 93% (n/a) | 86% (n/a) | 0.93 (0.89-0.98) |
| 52 | Hsu Score | BD, INR (or intraabdominal bleeding on exploratory laparotomy) | Not applicable | Hsu et al, 201393 | MTP | 90% (n/a) | 74% (n/a) | 0.86 (n/a) |

aClassical definition, 10 or more PRBCs in 24hrs

bCritical definition, 3 or more PRBCs in first hr

HR, heart rate; SBP, systolic blood pressure; BP, blood pressure; SI, shock index; MAP, mean arterial pressure; RR, respiratory rate; MSI, modified shock index; SIPA, shock index pediatric age adjusted; ED, emergency department; GCS, Glasgow coma scale; PP, pulse pressure; FAST, focused assessment with sonography in trauma; Hb, hemoglobin; INR, international normalized ratio; PPG, photoplethysmography; SpO2, peripheral capillary oxygen saturation; BE, base excess; BD, base deficit; GSW, gunshot wound; CT, computed tomography; TXA, tranexamic acid; PTT, partial thromboplastin time; CXR, chest x-ray; AO/OTA, Association of Osteosynthesis Foundation/Orthopaedic Trauma Association; CI, confidence interval; MTP, massive transfusion protocol; AUROC, area under the receiver operating characteristics

**Supplemental Table 2**. Elements and characteristics of scoring tools in predicting transfusion.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Scoring Tool** | **Variables** | **Applicability** | **Requires point of care ultrasound** | **Requires point of care blood testing** | **Validated in prehospital setting (y/n)** |
| 1 | Shock Index (SI) | HR, SBP | Applicable | - | - | Y |
| 2 | Shock Volume | Shock index over multiple time-points | Applicable | - | - | N |
| 3 | Modified SI (MSI) | HR, mean BP | Applicable | - | - | Y |
| 4 | SI x Age | HR, SBP, age | Applicable | - | - | N |
| 5 | Prehospital SI | HR, SBP in prehospital stage | Applicable | - | - | Y |
| 6 | Prehospital MSI | HR/MAP in prehospital stage | Applicable | - | - | Y |
| 7 | Shock index pediatric age adjusted (SIPA)/SI x age | HR, SBP, age | Applicable | - | - | N |
| 8 | Prehospital SIPA | HR, SBP, age | Applicable | - | - | Y |
| 9 | ED SIPA | HR, SBP, age | Applicable | - | - | N |
| 10 | Prehospital Index | SBP, HR, RR, level of consciousness | Applicable | - | - | Y |
| 11 | Trauma Induced Coagulopathy Clinical Score (TICCS)/Modified TICCS | General severity of trauma, SBP, extent of significant injuries | Applicable | - | - | Y |
| 12 | Pre-hospital Code Red Bleeding Protocol | Suspected or confirmed bleeding, SBP, patient unresponsive to fluid bolus | Applicable | - | - | Y |
| 13 | Extremity/Mechanism/Shock Index/GCS (EMS-G) Score | Obvious extremity injury, penetrating mechanisms, SI, GCS | Applicable | - | - | Y |
| 14 | PP and SI | PP, HR, SBP | Applicable | - | - | Y |
| 15 | Mechanism of Injury, Glasgow Coma Scale, Age, and Arterial Pressure (MGAP) Score | Mechanism, GCS, age, SBP | Applicable | - | - | Y |
| 16 | Revised Trauma Score (RTS) | GCS, SBP, RR | Applicable | - | - | N |
| 17 | Pre-arrival Model by Hwu et al. | HR, temperature, GCS, penetrating injury | Applicable | - | - | Y |
| 18 | Prehospital Pulse Pressure/Heart Rate Ratio | PP, HR (prehospital) | Applicable | - | - | Y |
| 19 | Injury Severity Score (ISS) | Worst head and neck injury, worst face injury, worst chest injury, worst abdominal injury, worst extremity (incl. pelvis) injury, worst external injury | Applicable | - | - | Y |
| 20 | Class-4 Hemorrhage Unresponsive to Lactated Ringer (CHULA) | Clinical signs of Class-4 hemorrhage, not responsive to 1-2L of Lactated Ringer’s bolus, and suspected ongoing bleeding | Applicable | - | - | N |
| 21 | ABC | Penetrating mechanism, systolic BP ≤ 90 mmHg in the ED, HR ≥ 120 in the ED, positive FAST | Potentially | x | - | Y |
| 22 | ABC-S | ABC with age-adjusted shock index (SIPA) | Potentially | x | - | N |
| 23 | ABCD + base deficit | ABC, SIPA, base deficit | Potentially | x | x | N |
| 24 | ABCD + lactate | ABC, SIPA, lactate | Potentially | x | x | N |
| 25 | ABCD + base deficit + lactate | ABC, SIPA, base deficit, lactate | Potentially | x | x | N |
| 26 | Traumatic Bleeding Severity Score (TBSS) | Age, SBP, FAST, pelvic fracture severity, serum lactate | Potentially | x | x | N |
| 27 | MTPitt | Sex, SBP, HR, GCS, RR, FAST, mechanism of injury (blunt vs. penetrating), open or dislocated femur fracture or unstable pelvic fracture | Potentially | x | - | N |
| 28 | MTPitt+Labs | Sex, SBP, HR, GCS, RR, FAST, mechanism of injury (blunt vs. penetrating), open or dislocated femur fracture or unstable pelvic fracture, Hb, INR, pH, base deficit | Potentially | x | x | N |
| 29 | Scoring System by Mackenzie et al. | Age, gender, prehospital SI, PPG waveform, SpO2s, HR | Potentially |  |  | N |
| 30 | Red Flag binary alert | SI>/=1, MAP </= 70mmHg, point of care Hb </= 13g/dl, unstable pelvis and pre-hospital intubation | Potentially | - | x | Y |
| 31 | Trauma Associated Severe Hemorrhage (TASH) | SBP, gender, Hb, FAST, HR, BE and fracture of the pelvis or femur | Potentially | x | x | Y |
| 32 | McLaughlin | HR, SBP, pH, hematocrit | Potentially | - | x | N |
| 33 | TICCS.BE (Base Excess) | General severity of trauma, SBP, extent of significant injuries, BE, FAST | Potentially | x | x | N |
| 34 | Phone App | Intercept, BD, mechanism (GSW vs. stab wound vs blunt injury), HR, SBP | Potentially | - | x | N |
| 35 | FASILA Score | FAST, SI, lactate | Potentially | x | x | N |
| 36 | Revised Assessment of Bleeding and Transfusion (RABT) | SI, pelvic fracture, FAST, penetrating mechanism | Potentially | x | - | N |
| 37 | Prince of Wales/Rainer Score | HR, SBP, GCS, pelvic fracture, free abdominal fluid (FAST or CT), BE, Hb | Potentially | x | x | Y |
| 38 | Scoring System by Rainer et al. | SBP, GCS, HR, displaced pelvic fracture, CT scan or FAST positive, BD, Hb, | Potentially | x | x | N |
| 39 | Milano Score | GCS, TXA, penetrating trauma, hemothorax, pelvic fracture, FAST, HR, SBP, PTT, limb amputation | Potentially | x | - | N |
| 40 | Scoring System by McLaughlin et al. | HR, SBP, pH, Hematocrit | Potentially | - | x | N |
| 41 | Dynamic Massive Blood Transfusion (DMBT) Score | SBP, HR, Hb, INR, BD, unstable pelvic fracture, hemoperitoneum on imaging | Potentially | - | x | N |
| 42 | Vandromme Score | Lactate, HR, INR, Hb, SBP | Potentially | - | x | N |
| 43 | Schreiber Score | Hb, INR, penetrating mechanism | Potentially | - | x | N |
| 44 | Larson Score | SBP, HR, Hb, BE | Potentially | - | x | Y |
| 45 | Mobile Application Modeling (Mina) | Complex formula using mobile application, with included variables being SBP, HR, base deficit | Potentially | - | x | N |
| 46 | Yumoto Screening Method | SI, BE, FAST | Potentially | x | x | N |
| 47 | Canadian Bleeding (CAN-BLEED) score | SBP, clinical examination findings suggestive of hemorrhage, lactate, FAST, free fluid or contrast extravasation on computed tomography | Not applicable | x | x | N |
| 48 | Emergency Transfusion Score (ETS) | SBP, FAST, clinical pelvic instability, age, admission from trauma scene, mechanism of injury | Not applicable | x | - | Y |
| 49 | Coagulopathy in Severe Trauma (COAST) Score | Long on-scene time or total prehospital time from injury to ED arrival, prehospital SBP, temperature on ED arrival, prehospital thorax drain (i.e., prehospital chest decompression), abdominal abbreviate injury scale | Not applicable | - | - | N |
| 50 | Modified TBSS | Age, SBP on arrival to ED, FAST, pelvic fracture severity, lactate | Not applicable | x | x | N |
| 51 | Military Acute Severe Haemorrhage (MASH) Score | Number of amputated limbs, number of femoral fractures (open/closed), number of open tibial fractures, severe pelvic injury, severe arterial bleed, hemothorax (on CXR), FAST, HR, SBP, RR, prehospital blood products administered, prehospital or ED tourniquet applied to control bleeding, prehospital or ED hemostatic agent required to control bleeding | Not applicable | x | - | N |
| 52 | Novel Predictive Score of Massive Hemorrhage in Pelvic Ring Fractures | Lactate, AO/OTA classification, pelvic extravasation on CT | Not applicable | - | x | N |
| 52 | Hsu Score | BD, INR (or intraabdominal bleeding on exploratory laparotomy) | Not applicable | - | x | N |

HR, heart rate; SBP, systolic blood pressure; BP, blood pressure; MAP, mean arterial pressure; RR, respiratory rate; ED, emergency department; SIPA, shock index pediatric age adjusted; SI, shock index; MSI, modified shock index; GCS, Glasgow coma scale; PP, pulse pressure; FAST, focused assessment with sonography in trauma; Hb, hemoglobin; INR, international normalized ratio; PPG, photoplethysmography; SpO2, peripheral capillary oxygen saturation; BE, base excess; BD, base deficit; GSW, gunshot wound; CT, computed tomography; TXA, tranexamic acid; PTT, partial thromboplastin time; CXR, chest x-ray; AO/OTA, Association of Osteosynthesis Foundation/Orthopaedic Trauma Association