| **Variables** | **Ministry of Health (N=241)** | **Private Practice (N=49)** | **University Hospital**  **(N=57)** | **P value** |
| --- | --- | --- | --- | --- |
| **Q1. If you do not provide or directly supervise anaesthesia for this type of patient, please indicate so below.** | | | | |
| I provide or directly supervise anaesthesia for this type of patient. | 241 (100.0) | 49 (100.0) | 57 (100.0) | 1.000 |
| I do not provide or directly supervise anaesthesia for this type of patient. | 0 (0) | 0 (0) | 0 (0) |  |
| **Q2. How many times in a typical work week do you provide or directly supervise anaesthesia for a high-risk surgery patient?** | | | | |
| Rarely or Never | 7 (2.9) | 10 (20.4) | 1 (1.8) | - |
| 1 to 5 times a week | 177 (73.4) | 27 (55.1) | 45 (78.9) |  |
| 6 to 10 times a week | 47 (19.5) | 6 (12.2) | 8 (14.0) |  |
| More than 11 times a week | 10 (4.1) | 6 (12.2) | 3 (5.3) |  |
| **Q4. Does your institution or group have a written protocol, care guide, or statement concerning hemodynamic management in this setting?** | | | | |
| Yes | 32 (13.3) | 8 (16.3) | 13 (22.8) | 0.474 |
| No | 177 (73.4) | 35 (71.4) | 36 (63.2) |  |
| Unsure | 32 (12.2) | 6 (12.2) | 8 (14.0) |  |
| **Q5. What hemodynamic monitoring do you routinely use for the management of high-risk surgery patients? (please mark all that apply)** | | | | |
| Non-invasive arterial pressure | 183 (76.3) | 36(73.5) | **33 (57.9)** | **0.022\*** |
| Invasive arterial pressure | 234 (97.5) | 48 (98.0) | 57 (100.0) | 0.711 |
| Plethysmographic waveform variation | 56 (23.3) | 10 (20.4) | 13 (22.8) | 0.906 |
| Global end diastolic volume | 8 (3.3) | 4 (8.2) | 5 (8.8) | 0.090 |
| Central venous pressure | **77 (32.1)** | 33 (67.3) | 36 (63.2) | **<0.001\*** |
| Stroke volume variation | 62 (25.8) | 11 (22.4) | **34 (59.6)** | **<0.001\*** |
| Mixed venous saturation (SvO2) | 19 (7.9) | 3 (6.1) | 8 (14.0) | 0.293 |
| Central venous saturation (ScvO2) | 40 (16.7) | 6 (12.2) | 7 (12.3) | 0.577 |
| Oxygen delivery (DO2) | 7 (2.9) | 2 (4.1) | 4 (7.0) | 0.307 |
| Pulse pressure variation | 137 (57.1) | **12 (24.5)** | 30 (53.6) | **<0.001\*** |
| Near infrared spectroscopy | **6 (2.5)** | 5 (10.2) | 8 (14.0) | **<0.001\*** |
| Pulmonary capillary wedge pressure | 8 (3.3) | 1 (2.0) | 6 (10.5) | 0.050 |
| Transesophageal echocardiography | 0 (0) | 0 (0) | 0 (0) | - |
| Systolic pressure variation | 60 (25.0) | **4 (8.2)** | 15 (26.3) | **0.030\*** |
| Cardiac output / Stroke volume | 60 (25.0) | 12 (24.5) | **36 (63.2)** | **<0.001\*** |
| Systemic vascular resistance (SVR) | 49 (20.4) | 10 (20.4) | **33 (57.9)** | **<0.001\*** |
| **Q6. How frequently do you try to optimize arterial pressure intraoperatively in this setting?** | | | | |
| Never | 2 (0.8) | 1 (2.0) | 0 (0.0) | - |
| Less than 5 percent of the time | 5 (2.1) | 4 (8.2) | 1 (1.8) |  |
| Between 6 and 25 percent of the time | 38 (15.8) | 5 (10.2) | 7 (12.3) |  |
| Between 26 and 50 percent of the time | 35 (14.5) | 2 (4.1) | 7 (12.3) |  |
| Between 51 and 75 percent of the time | 33 (13.7) | 5 (10.2) | 7 (12.3) |  |
| More than 75 percent of the time | 128 (53.1) | 32 (65.3) | 35 (61.4) |  |
| **Q7. How frequently do you try to optimize central venous pressure in this setting?** | | | | |
| Never | 106 (44.0) | 13 (26.5) | 8 (14.0) | **-** |
| Less than 5 percent of the time | 75 (31.1) | 15 (30.6) | 20 (35.1) |  |
| Between 6 and 25 percent of the time | 25 (10.4) | 7 (14.3) | 8 (14.0) |  |
| Between 26 and 50 percent of the time | 8 (3.3) | 3 (6.1) | 7 (12.3) |  |
| Between 51 and 75 percent of the time | 14 (5.8) | 4 (8.2) | 8 (14.0) |  |
| More than 75 percent of the time | 13 (5.4) | 7 (14.3) | 6 (10.5) |  |
| **Q8. How frequently do you try to optimize stroke volume and/or cardiac output in this setting?** | | | | |
| Never | 84 (34.9) | 20 (40.8) | 7 (12.3) | - |
| Less than 5 percent of the time | 37 (15.4) | 5 (10.2) | 6 (10.5) |  |
| Between 6 and 25 percent of the time | 27 (11.2) | 3 (6.1) | 8 (14.0) |  |
| Between 26 and 50 percent of the time | 21 (8.7) | 5 (10.2) | 9 (15.8) |  |
| Between 51 and 75 percent of the time | 29 (12.0) | 6 (12.2) | 9 (15.8) |  |
| More than 75 percent of the time | 43 (17.8) | 10 (20.4) | 18 (31.6) |  |
| **Q9. How frequently do you try to optimize central venous oxygen saturation (ScvO2) in this setting?** | | | | |
| Never | 127 (52.7) | 31 (63.3) | 18 (31.6) | - |
| Less than 5 percent of the time | 65 (27.0) | 10 (20.4) | 16 (28.1) |  |
| Between 6 and 25 percent of the time | 19 (7.9) | 2 (4.1) | 6 (10.5) |  |
| Between 26 and 50 percent of the time | 17 (7.1) | 1 (2.0) | 4 (7.0) |  |
| Between 51 and 75 percent of the time | 8 (3.3) | 2 (4.1) | 6 (10.5) |  |
| More than 75 percent of the time | 5 (2.1) | 3 (6.1) | 7 (12.3) |  |
| **Q10. How frequently do you try to optimize mixed venous oxygen saturation (SvO2) in this setting?** | | | | |
| Never | 144 (59.8) | 33 (67.3) | 22 (38.6) | - |
| Less than 5 percent of the time | 55 (22.8) | 10 (20.4) | 17 (29.8) |  |
| Between 6 and 25 percent of the time | 14 (5.8) | 1 (2.0) | 3 (5.3) |  |
| Between 26 and 50 percent of the time | 15 (16.2) | 2 (4.1) | 4 (7.0) |  |
| Between 51 and 75 percent of the time | 9 (3.7) | 0 (0.0) | 3 (5.3) |  |
| More than 75 percent of the time | 4 (1.7) | 3 (6.1) | 8 (14.0) |  |
| **Q11. How frequently do you try to optimize dynamic parameters of fluid responsiveness (pulse pressure variation, systolic pressure variation, plethysmographic waveform variation) in this setting?** | | | | |
| Never | 34 (14.1) | 15 (30.6) | 5 (8.8) | - |
| Less than 5 percent of the time | 33 (13.7) | 10 (20.4) | 7 (12.3) |  |
| Between 6 and 25 percent of the time | 40 (16.6) | 5 (10.2) | 11 (19.3) |  |
| Between 26 and 50 percent of the time | 37 (15.4) | 5 (10.2) | 7 (12.3) |  |
| Between 51 and 75 percent of the time | 42 (17.4) | 7 (14.3) | 10 (17.5) |  |
| More than 75 percent of the time | 55 (22.8) | 7 (14.3) | 17 (29.8) |  |
| **Q12. If you optimize hemodynamics in high risk surgery patients, when do you do it? (please mark all that apply)** | | | | |
| Before anaesthesia induction | 214 (89.2) | 37 (78.7) | 49 (87.5) | 0.150 |
| After anaesthesia induction | 193 (80.4) | 38 (80.9) | 45 (80.4) | 1.000 |
| During surgery | 197 (82.4) | 42 (89.4) | 45 (80.4) | 0.431 |
| Postoperative period | 174 (73.1) | 34 (72.3) | 36 (64.3) | 0.417 |
| **Q13. When do you think that hemodynamic optimization is of most value?** | | | | |
| Before anaesthesia induction | 121 (50.2) | 23 (46.9) | 24 (42.1) | - |
| After anaesthesia induction | 26 (10.8) | 2 (4.1) | 5 (8.8) |  |
| During surgery | 92 (38.2) | 23 (46.9) | 27 (47.4) |  |
| Postoperative period | 2 (0.8) | 1 (2.0) | 1 (1.8) |  |
| **Q14. Regarding respiratory variations in arterial pulse and/or systolic pressure: how do you measure these indices in the clinical setting?** | | | | |
| Eyeballing | 163 (67.6) | 33 (67.3) | 30 (52.6) | - |
| Manual Calculation | 9 (3.7) | 1 (2.0) | 0 (0.0) |  |
| Automatic measurement using specific software | 67 (27.8) | 14 (28.6) | 27 (47.4) |  |
| Not measured | 1 (0.4) | 1 (2.0) | 0 (0.0) |  |
| Unsure | 1 (0.4) | 0 (0.0) | 0 (0.0) |  |
| **Q15. What technique do you use to monitor cardiac output (please mark all that apply)** | | | | |
| Lidco Monitor | 17 (7.1) | 0 (0.0) | 7 (12.3) | 0.059 |
| Thoracic bioimpedance | 2 (0.8) | 0 (0.0) | 0 (0.0) | 1.000 |
| Esophageal Doppler | 3 (1.2) | 2 (4.1) | 4 (7.0) | 0.050 |
| Vigileo Monitor | 0 (0) | 0 (0) | 0 (0) | - |
| Swanz Ganz | 13 (5.4) | 4 (8.2) | 7 (12.3) | 0.201 |
| Picco monitor | 56 (23.2) | 10 (20.4) | 15 (26.3) | 0.837 |
| Transesophageal echocardiography | **13 (5.4)** | 7 (14.3) | 11 (19.3) | **0.003\*** |
| Transthoracic echocardiography | 103 (42.7) | 16 (32.7) | 17 (29.8) | 0.097 |
| EV1000/Hemosphere | 54 (22.4) | 9 (18.3) | **35 (61.4)** | **<0.001\*** |
| Acumen | 0 (0.0) | 0 (0.0) | 1 (1.8) | 0.307 |
| Clinical | 3 (1.2) | 3 (6.1) | 0(0.0) | 0.084 |
| Not Available | 31 (12.9) | 8 (16.3) | **1 (1.8)** | **0.029\*** |
| USCOM | 12 (5.0) | 3 (6.1) | 1 (1.8) | 0.545 |
| Arterial line waveform | 2 (0.8) | 1 (2.0) | 0 (0.0) | 0.452 |
| **Q16. If you do not monitor cardiac output routinely in these patients, what are the main reasons for not monitoring it? (please mark all that apply)** | | | | |
| I use SvO2 and/or ScVO2 as surrogates for cardiac output monitoring | 10 (4.1) | 0 (0.0) | 6 (10.5) | 0.075 |
| I use dynamic parameters of fluid responsiveness (Pulse Pressure Variations, Systolic Pressure Variations, Plethysmographic Waveform Variations) as surrogates for cardiac | 97 (40.2) | **12 (24.5)** | 23 (40.4) | **0.039\*** |
| Available cardiac output monitoring solutions are too invasive | 28 (11.6) | 7 (14.3) | 4 (7.0) | 0.514 |
| Cardiac output monitoring equipment not readily available | 170 (70.5) | 37 (75).5) | **20 (35.1)** | **<0.001\*** |
| Cardiac output monitoring does not provide any additional clinically relevant information in this setting | 9 (3.7) | 1 (2.0) | 2 (3.5) | 1.000 |
| Cost | 6 (2.5) | 1 (2.0) | 5 (8.8) | 0.140 |
| Unfamiliarity in utilizing cardiac output monitoring | 26 (10.8) | 5 (10.2) | 5 (8.8) | 0.980 |
| I monitor cardiac output routinely | 0 (0.0) | 1 (2.0) | 1 (1.8) | 0.317 |
| Clinical evaluation & fluid responsiveness | 0 (0.0) | 0 (0.0) | 1 (1.8) | 0.317 |
| Available cardiac output monitoring solutions are unreliable | 6 (2.5) | 1 (2.0) | 0 (0.0) | 0.744 |
| **Q17. What are your indicators for volume expansion in this setting (diagnostic tools)? (please mark all that apply)** | | | | |
| Central venous pressure | **67 (27.8)** | 20 (40.8) | 26 (45.6) | **0.015\*** |
| Central venous saturation (SvO2) | 23 (9.5) | 4 (8.2) | 7 (12.3) | 0.755 |
| Urine output | **200 (83.0)** | 38 (77.6) | 38 (66.7) | **0.021\*** |
| Cardiac output | 95 (39.4) | 15 (30.6) | 31 (54.4) | 0.036 |
| Transesophageal echocardiography | 28 (11.6) | 8 (16.3) | 11 (19.3) | 0.259 |
| Mixed venous saturation ScvO2 | 11 (4.6) | 2 (4.1) | 5 (8.8) | 0.384 |
| Pulse pressure variation or Systolic pressure variation | 157 (65.1) | **18 (36.7)** | 34 (59.6) | **0.001\*** |
| Stroke volume variation | 100 (41.5) | **16 (32.7)** | 34 (59.6) | **0.012\*** |
| Pulmonary capillary wedge pressure | 3 (1.2) | 3 (6.1) | 5 (8.8) | 0.056 |
| Plethysmographic waveform variation | 36 (14.9) | 6 (12.2) | 2 (3.5) | 0.066 |
| Global end diastolic volume | 15 (6.2) | 3 (6.1) | 6 (10.5) | 0.484 |
| Clinical experience | 155 (64.3) | 35 (71.4) | 33 (57.9) | 0.350 |
| Blood pressure | 213 (88.4) | 40 (81.6) | **36 (63.2)** | **0.001\*** |
| **Q18. How do you routinely assess the hemodynamic effects of volume expansion in this setting? (please mark all that apply)** | | | | |
| Increase in urine output | 187 (77.6) | 40 (81.6) | **35 (61.4)** | **0.021\*** |
| Increase in cardiac output | 110 (45.6) | 23 (46.9) | 30 (52.6) | 0.636 |
| Decrease in stroke volume | 94 (39.0) | 16 (32.7) | **36 (63.2)** | **0.001\*** |
| Dercrease in pulse pressure | 156 (64.7) | **22 (44.9)** | 32 (56.1) | **0.027\*** |
| Increase in blood pressure | 199 (82.6) | 40 (81.6) | **38 (66.7)** | **0.025\*** |
| Increase in mixed SCvO2 | 9 (3.7) | 3 (6.1) | 4 (7.0) | 0.372 |
| Decrease in heart rate | 196 (81.3) | 36 (73.5) | 38 (66.7) | 0.042 |
| Decrease in plethysmographic | 52 (21.6) | 10 (20.4) | 7 (12.3) | 0.285 |
| Increase in central venous saturation | 14 (5.8) | 4 (8.2) | 6 (10.5) | 0.346 |
| **Q19. In your opinion, what best predicts an increase in cardiac output following volume expansion?-** | | | | |
| Central venous pressure | 0 (0.0) | 1 (2.0) | 0 (0.0) | - |
| Mixed venous saturation (SCvO2) | 0 (0.0) | 0 (0.0) | 1 (2.0) |  |
| Global end diastolic volume | 13 (5.4) | 4 (8.2) | 2 (3.5) |  |
| Stroke volume variation | 62 (25.7) | 11 (22.4) | 16 (28.1) |  |
| Transesophageal echocardiography | 25 (10.4) | 4 (8.2) | 3 (5.3) |  |
| Pulse pressure variation | 33 (13.7) | 3 (6.1) | 6 (10.5) |  |
| Central venous saturation (ScvO2) | 1 (0.4) | 0 (0.0) | 0 (0.0) |  |
| Plethysmographic waveform variation | 2 (0.8) | 1 (2.0) | 0 (0.0) |  |
| Cardiac output | 61 (25.3) | 10 (20.4) | 15 (26.3) |  |
| Clinical experience | 14 (5.8) | 4 (8.2) | 2 (3.5) |  |
| Pulmonary capillary wedge pressure | 5 (2.1) | 2 (4.1) | 3 (5.3) |  |
| Blood pressure | 25 (10.4) | 8 (16.3) | 6 (10.5) |  |
| **Q20. What is your first choice solution for volume expansion?** | | | | |
| Human albumin | 42 (17.4) | 3 (6.1) | 12 (21.1) | - |
| Hydroxyethylstarch solutions | 2 (0.8) | 1 (2.0) | 6 (10.5) |  |
| Crystalloids | 181 (75.1) | 37 (75.5) | 35 (61.4) |  |
| Dextans | 0 (0.0) | 0 (0.0) | 0 (0.0) |  |
| Blood derived products | 6 (2.5) | 1 (2.0) | 3 (5.3) |  |
| Gelatin | 10 (4.1) | 7 (14.3) | 1 (1.8) |  |
| **Q21. Do you or your department/group manage these patients in the intensive care unit (ICU)?** | | | | |
| Yes | 227 (94.2) | 48 (98.0) | 54 (94.7) | 0.695 |
| No | 14 (5.8) | 1 (2.0) | 3 (5.3) |  |
| **Q22. If not, who manages these patients in the ICU?** | | | | |
| Intensivist | 50 (20.7) | 6 (12.2) | 12 (21.1) | - |
| Surgeons | 2(0.8) | 0 (0.0) | 0 (0.0) |  |
| Other anaesthesiologist | 26 (10.8) | 4 (8.2) | 4 (7.0) |  |
| Other physicians than anesthesiologists or surgeon | 3 (1.2) | 0 (0.0) | 0 (0.0) |  |
| Mixed population | 11 (4.6) | 10 (20.4) | 6 (10.5) |  |
| **Q23. Do you believe that oxygen delivery to tissues is of major importance in patients during high risk surgery?** | | | | |
| Yes | 241 (100.0) | 49 (100.0) | 57 (100.0) | 1.000 |
| No | 0 (0) | 0 (0) | 0 (0) |  |
| **Q24. What parameter(s) is (are) involved in oxygen delivery to tissues? (please mark all that apply)** | | | | |
| Arterial pressure | 147 (61.0) | 34 (69.4) | 28 (49.1) | 0.095 |
| Cardiac output | 226 (93.8) | 46 (93.9) | 52 (91.2) | 0.710 |
| Central venous pressure | 36 (14.9) | 13 (26.5) | 10 (17.5) | 0.143 |
| PaO2 | 218 (90.5) | 45 (91.8) | 45 (78.9) | 0.036 |
| SaO2 | 190 (78.8) | 39 (79.6) | 42 (73.7) | 0.674 |
| Hemoglobin | 234 (97.1) | 49 (100.0) | 56 (98.2) | 0.746 |
| **Q25. Do you believe that your current hemodynamic management could be improved?** | | | | |
| Yes | 239 (99.2) | 47 (95.9) | 54 (94.7) | 0.911 |
| No | 2 (0.8) | 2 (4.1) | 3 (5.3) |  |
| **Q26. Which statement best describes you?** | | | | |
| Cardiac surgery patients | 10 (4.1) | 6 (12.2) | 9 (15.8) | **0.002\*** |
| Practicing intensive care | 3 (1.2) | 0 (0.0) | 3 (5.3) |  |
| Variety of patients | 228 (94.6) | 43 (87.8) | 45 (78.9) |  |
| **Q28. Have you completed any fellowship/subspecialty training?** | | | | |
| Yes | **17 (7.1)** | 15 (30.6) | 13 (22.8) | **<0.001** |
| No | 224 (92.9) | 34 (69.4) | 44 (77.2) |  |
| **Q31. How many intensive care unit beds does your primary hospital have?** | | | | |
| 7 or less | 32 (13.3) | 24 (49.0) | 1 (1.8) | - |
| 8 to 10 | 19 (7.9) | 6 (12.2) | 8 (14.0) |  |
| 11 to 15 | 42 (17.4) | 9 (18.4) | 23 (40.4) |  |
| 16 to 20 | 31 (12.9) | 3 (6.1) | 11 (19.3) |  |
| 21 to 30 | 65 (27.0) | 6 (12.2) | 8 (14.0) |  |
| 31 to 40 | 39 (16.2) | 1 (2.0) | 2 (3.5) |  |
| More than 40 | 13 (5.4) | 0 (0.0) | 4 (7.0) |  |
| **Q32. How many beds does your primary hospital have?** | | | | |
| 100 or less | 6 (2.5) | 11 (22.4) | 0 (0.0) | - |
| 101 to 250 | 18 (7.5) | 19 (38.8) | 4 (7.0) |  |
| 251 to 500 | 62 (25.7) | 13 (26.5) | 15 (26.3) |  |
| 501 to 1000 | 95 (39.4) | 5 (10.2) | 25 (43.9) |  |
| More than 1000 | 60 (24.9) | 1 (2.0) | 13 (22.8) |  |
| **Q33. What is the estimated population of your practice location?** | | | | |
| Less than 10,000 | 7 (2.9) | 1 (2.0) | 5 (8.8) | - |
| 10,000 to 50,000 | 27 (11.2) | 7 (14.3) | 5 (8.8) |  |
| 50,001 to 100,000 | 43 (17.8) | 7 (14.3) | 13 (22.8) |  |
| 100,001 to 500,000 | 80 (33.2) | 14 (28.6) | 11 (19.3) |  |
| More than 500,000 | 73 (30.3) | 19 (38.8) | 19 (33.3) |  |
| **Years of practice** | 3.0 [1.0 – 6.0] | 4.0 [2.0 – 5.0] | 7.0 [2.0 – 11.0] | **<0.001\***  MoH vs Private = 0.244  MoH vs HU = **<0.001\***  Private vs HU = **0.016\*** |

Data were expresses in frequency (%) or median [25th percentile – 75th percentile] as appropriate.

**Out of 361 participants, 12 are not providing anaesthesia and 2 are below 18 years old.**

Written protocol

