

**Supplementary Data 1.** Full search strategy for multi-database literature search.

**Search Strategy:**

All three searches used the same search terms and truncations. However, the three databases used a searched through a different method.

PubMed – Title/abstract

EMBASE – All fields

Cochrane Reviews – Title/abstract/keyword

**Search terms used in all three databases**

“subdural haematoma” OR “subdural hematoma” OR “subdural haemorrhage”, “subdural hematoma”

**AND**

Outcome\* OR Compar\* OR Morbid\* OR Mortality\* OR Complication\* OR reoccur\* recur\*

**AND**

Surg\* OR operati\* OR “non surgical” OR “non-surgical” OR “nonsurgical” OR “burrhole” OR “crani\*”

**AND**

Old\* OR frail\* OR geri\*OR elder\*

**Supplementary Data 2.** Subgroup analysis of studies published before and after 2000.

Studies published before 2000 were hypothesised to report poorer outcomes than studies published after 2000 given advances in healthcare *a priori*. Steps taken to test this are detailed below using mortality at discharge as the outcome measure.

| <b>Study No.</b> | <b>Study, Year</b>          | <b>Deaths at Discharge</b> | <b>Total</b> |
|------------------|-----------------------------|----------------------------|--------------|
| 1                | Wilberger 1991 <sup>1</sup> | 23                         | 28           |
| 2                | Cagetti 1992 <sup>2</sup>   | 23                         | 26           |
| 3                | Kotwica 1992 <sup>3</sup>   | 23                         | 27           |
| 4                | Petridis 2009 <sup>4</sup>  | 64                         | 119          |
| 5                | Taussky 2012 <sup>5</sup>   | 13                         | 37           |
| 6                | Benedetto 2017 <sup>6</sup> | 37                         | 67           |
| 7                | Won 2017 <sup>7</sup>       | 13                         | 56           |
| 8                | Monsivais 2018 <sup>8</sup> | 47                         | 112          |
| 9                | Bus 2018 <sup>9</sup>       | 44                         | 84           |
| 10               | Akbik 2019 <sup>10</sup>    | 24                         | 62           |
| 11               | Trevisi 2020 <sup>11</sup>  | 51                         | 147          |
| 12               | Younsi 2020 <sup>12</sup>   | 9                          | 27           |

### *Identifying influential/ outlying studies*

R code output demonstrating studies in descending order with respect to their residual estimates. Studies with z-value  $> 1.5$  were considered as potential outliers.

|    | resid   | se     | z       |
|----|---------|--------|---------|
| 2  | 0.4342  | 0.2127 | 2.0413  |
| 3  | 0.3859  | 0.2199 | 1.7548  |
| 1  | 0.3444  | 0.2254 | 1.5277  |
| 7  | -0.3219 | 0.2179 | -1.4774 |
| 11 | -0.1899 | 0.2284 | -0.8318 |
| 12 | -0.1975 | 0.2440 | -0.8096 |
| 5  | -0.1800 | 0.2402 | -0.7496 |
| 10 | -0.1429 | 0.2372 | -0.6026 |
| 8  | -0.1084 | 0.2357 | -0.4597 |
| 6  | 0.0357  | 0.2407 | 0.1484  |
| 4  | 0.0204  | 0.2380 | 0.0857  |
| 9  | 0.0050  | 0.2397 | 0.0210  |

*Leave-one-out tests to ascertain whether outliers are influential*

|    | estimate | zval      | pval     | ci.lb    | ci.ub    | Q         | Qp       | tau2     | I2        | H2        |
|----|----------|-----------|----------|----------|----------|-----------|----------|----------|-----------|-----------|
| 1  | 0.490632 | 12.417732 | 0.000000 | 0.367038 | 0.614786 | 73.368265 | 0.000000 | 0.038132 | 91.171885 | 11.327446 |
| 2  | 0.483338 | 13.222985 | 0.000000 | 0.368397 | 0.599144 | 67.141710 | 0.000000 | 0.032437 | 89.808784 | 9.812371  |
| 3  | 0.487247 | 12.750372 | 0.000000 | 0.367424 | 0.607788 | 70.593036 | 0.000000 | 0.035606 | 90.617619 | 10.658275 |
| 4  | 0.517500 | 11.346678 | 0.000000 | 0.377123 | 0.656538 | 86.566590 | 0.000000 | 0.049536 | 92.163460 | 12.760734 |
| 5  | 0.533819 | 11.975985 | 0.000000 | 0.397708 | 0.667514 | 86.933142 | 0.000000 | 0.046334 | 92.524143 | 13.376393 |
| 6  | 0.516182 | 11.374204 | 0.000000 | 0.376397 | 0.654740 | 87.156905 | 0.000000 | 0.049256 | 92.633846 | 13.575606 |
| 7  | 0.545648 | 13.087135 | 0.000000 | 0.419060 | 0.669424 | 74.186796 | 0.000000 | 0.039037 | 91.016112 | 11.131038 |
| 8  | 0.528963 | 11.623067 | 0.000000 | 0.389688 | 0.666066 | 87.768239 | 0.000000 | 0.048445 | 92.068686 | 12.608251 |
| 9  | 0.518889 | 11.377863 | 0.000000 | 0.378617 | 0.657719 | 88.032457 | 0.000000 | 0.049508 | 92.499065 | 13.331671 |
| 10 | 0.531523 | 11.784654 | 0.000000 | 0.393656 | 0.667077 | 87.254073 | 0.000000 | 0.047480 | 92.431292 | 13.212294 |
| 11 | 0.536202 | 12.018474 | 0.000000 | 0.400142 | 0.669679 | 77.809426 | 0.000000 | 0.045792 | 91.306256 | 11.502524 |
| 12 | 0.534470 | 12.069039 | 0.000000 | 0.399278 | 0.667234 | 87.048828 | 0.000000 | 0.045823 | 92.553793 | 13.429656 |

|    | rstudent | dffits  | cook.d | cov.r  | tau2.del | QE.del  | hat    | weight | dfbs    | inf |
|----|----------|---------|--------|--------|----------|---------|--------|--------|---------|-----|
| 1  | 1.5277   | 0.4540  | 0.1835 | 0.9554 | 0.0381   | 73.3683 | 0.0776 | 7.7642 | 0.4562  |     |
| 2  | 2.0413   | 0.6096  | 0.2917 | 0.8271 | 0.0324   | 67.1417 | 0.0767 | 7.6678 | 0.6174  |     |
| 3  | 1.7548   | 0.5229  | 0.2306 | 0.8984 | 0.0356   | 70.5930 | 0.0772 | 7.7175 | 0.5271  |     |
| 4  | 0.0857   | 0.0161  | 0.0003 | 1.2231 | 0.0495   | 86.5666 | 0.0889 | 8.8917 | 0.0161  |     |
| 5  | -0.7496  | -0.2277 | 0.0543 | 1.1421 | 0.0463   | 86.9331 | 0.0809 | 8.0874 | -0.2275 |     |
| 6  | 0.1484   | 0.0353  | 0.0014 | 1.2133 | 0.0493   | 87.1569 | 0.0859 | 8.5907 | 0.0353  |     |
| 7  | -1.4774  | -0.4374 | 0.1720 | 0.9838 | 0.0390   | 74.1868 | 0.0846 | 8.4625 | -0.4371 |     |
| 8  | -0.4597  | -0.1513 | 0.0252 | 1.1985 | 0.0484   | 87.7682 | 0.0887 | 8.8666 | -0.1517 |     |
| 9  | 0.0210   | -0.0040 | 0.0000 | 1.2205 | 0.0495   | 88.0325 | 0.0873 | 8.7273 | -0.0040 |     |
| 10 | -0.6026  | -0.1909 | 0.0392 | 1.1731 | 0.0475   | 87.2541 | 0.0854 | 8.5376 | -0.1910 |     |
| 11 | -0.8318  | -0.2643 | 0.0727 | 1.1406 | 0.0458   | 77.8094 | 0.0897 | 8.9692 | -0.2646 |     |
| 12 | -0.8096  | -0.2388 | 0.0591 | 1.1264 | 0.0458   | 87.0488 | 0.0772 | 7.7175 | -0.2385 |     |

*Moderator analysis (using pre/post 2000 as moderator and logit transformation for each group)*

Fixed-Effects with Moderators Model (k = 2)

I<sup>2</sup> (residual heterogeneity / unaccounted variability): 0.00%

H<sup>2</sup> (unaccounted variability / sampling variability): 1.00

Test for Residual Heterogeneity:

QE(df = 0) = 0.000, p-val = 1.000

Test of Moderators (coefficient 2):

QM(df = 1) = 48.197, p-val < .001

Model Results:

|                  | estimate | se    | zval   | pval  | ci.lb | ci.ub |     |
|------------------|----------|-------|--------|-------|-------|-------|-----|
| intrcpt          | 0.701    | 0.037 | 19.132 | <.001 | 0.629 | 0.773 | *** |
| studyyearpre2000 | 0.459    | 0.066 | 6.942  | <.001 | 0.329 | 0.589 | *** |

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**Supplementary Data 3.** Indications for conservative management in included studies, and subsequent mortality/ outcomes.

| Author, Year                       | No. of Patients | <i>At Discharge (N, %)</i> |           |           | <i>At Long Term Follow Up (N, %)</i> |           |           |          | Indications                                                                                                                                                                               |
|------------------------------------|-----------------|----------------------------|-----------|-----------|--------------------------------------|-----------|-----------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    |                 | Deaths                     | GOS 1 – 3 | GOS 4 – 5 | Deaths                               | GOS 1 – 3 | GOS 4 – 5 | Duration |                                                                                                                                                                                           |
| Taussky et al., 2012 <sup>5</sup>  | 5               | -                          | -         | -         | -                                    | 5         | 0         | 6        | Any patients not fulfilling criteria for surgery (see <b>Supplementary Table 2</b> ), or with bilaterally fixed pupils.                                                                   |
| Won et al., 2017 <sup>7</sup>      | 7               | -                          | -         | -         | 5                                    | 7         | 0         | 3        | Not specified. Seven out of 68 patients were managed conservatively due to inoperable comorbidities.                                                                                      |
| Sufaro et al., 2019 <sup>13</sup>  | 26              | 2                          | -         | -         | 9                                    | -         | -         | 12       | No specific indications for conservative management given. No significant differences between surgical and conservative groups except for ASDH thickness and focal neurological deficit.  |
| Trevisi et al., 2020 <sup>11</sup> | 66              | 14                         | 21        | 45        | 21                                   | 27        | 39        | 6        | No specific indications for conservative management. Significantly larger proportion of conservatively managed patients in GCS 13 - 15 category (77%) compared with surgical (36%) group. |

**Supplementary Data 4.** Indications for surgical intervention in included studies.

| <b>Author, Year</b>                 | <b>Indication/ Prerequisites</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wilberger et al., 1991 <sup>1</sup> | Surgical indication not specified.<br>All included patients had ASDH thickness $\geq$ 3mm and MLS $>$ 5 mm.<br>Following patients were excluded from analyses: <ul style="list-style-type: none"> <li>• Timing of surgery could not be determined</li> <li>• Open head injuries, prolonged hypotension/ hypoxia, severe life-threatening extra-cranial injuries</li> </ul>                                                                                                                                                             |
| Massaro et al., 1996 <sup>14</sup>  | Surgical indications- MLS $>$ 5 mm<br>Following patients were excluded- open head injury, prolonged hypotension, hypoxia or severe life threatening injuries                                                                                                                                                                                                                                                                                                                                                                           |
| Koc et al., 1997 <sup>15</sup>      | Surgical indications- ASDH thickness $>$ 10mm, MLS $>$ 5 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Taussky et al., 2012 <sup>5</sup>   | Following patients considered suitable for surgical intervention: <ul style="list-style-type: none"> <li>• Pre-morbid functional status- KPS of at least 80, usually independent</li> <li>• Co-morbidities- no evidence of dementia, no comorbidities limiting survival to less than 12 months</li> <li>• Surgical indications- MLS <math>\geq</math>5mm; GCS <math>\leq</math>13</li> </ul>                                                                                                                                           |
| Merzo et al., 2016 <sup>16</sup>    | Not specified for ASDH patients, though general indications for surgical intervention in TBI patients given                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Raj et al., 2016 <sup>17</sup>      | Brain trauma foundation guidelines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Benedetto et al., 2017 <sup>6</sup> | Following patients considered suitable for surgical intervention: <ul style="list-style-type: none"> <li>• ASDH thickness <math>&gt;</math> 10 mm or MLS <math>&gt;</math>5 mm with patient of any GCS</li> <li>• GCS drop of 2 points or more, with less severe ASDH thickness/ MLS</li> </ul> Following patients were excluded from analysis: <ul style="list-style-type: none"> <li>• Bilateral fixed pupils</li> <li>• Concomitant EDH or significant cerebral contusions</li> <li>• Major thoracic or abdominal trauma</li> </ul> |
| Monsivais et al., 2018 <sup>8</sup> | Following patients considered unsuitable for surgical intervention: <ul style="list-style-type: none"> <li>• Neurologically poor- GCS 3 - 5 with or without pupillary involvement with evidence of impending herniation on CT imaging</li> <li>• Haemodynamic instability, unsuitable for ventilation, or severe cardiac/ pulmonary compromise</li> </ul>                                                                                                                                                                              |

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                         | <ul style="list-style-type: none"> <li>• Advanced malignancy with metastatic disease</li> </ul>                                                                                                                                                                                                                                                                                                                         |
| Sufaro et al., 2019 <sup>13</sup>       | <p>Following patients considered suitable for inclusion:</p> <ul style="list-style-type: none"> <li>• GCS 13 - 15 and at least one of the following- ASDH thickness &gt; 10mm, MLS &gt; 5 mm, GCS drop of 2 points or more from time of injury</li> <li>• Surgical intervention performed predominantly in patients with evolving hemiparesis</li> </ul> <p>Patients with significant major injuries were excluded.</p> |
| Trevisi et al., 2020 <sup>11</sup>      | <p>Following patients considered suitable for surgical intervention:</p> <ul style="list-style-type: none"> <li>• ASDH thickness &gt; 10mm, MLS &gt;5 mm (unless other clinical features/ demographics/ baseline functional status were not in favour of surgical intervention- objective parameters not specified)</li> </ul>                                                                                          |
| Cagetti et al., 1992 <sup>2</sup>       | Not specified                                                                                                                                                                                                                                                                                                                                                                                                           |
| Kotwica & Jakubowski, 1992 <sup>3</sup> | Not specified                                                                                                                                                                                                                                                                                                                                                                                                           |
| Akbik et al., 2009 <sup>10</sup>        | Not specified                                                                                                                                                                                                                                                                                                                                                                                                           |
| Petridis et al., 2009 <sup>4</sup>      | Not specified                                                                                                                                                                                                                                                                                                                                                                                                           |
| Hamed et al., 2016 <sup>18</sup>        | Not specified                                                                                                                                                                                                                                                                                                                                                                                                           |
| Won et al., 2017 <sup>7</sup>           | Not specified                                                                                                                                                                                                                                                                                                                                                                                                           |
| Bus et al., 2019 <sup>9</sup>           | Not specified                                                                                                                                                                                                                                                                                                                                                                                                           |
| McGinity et al., 2017 <sup>19</sup>     | Not specified                                                                                                                                                                                                                                                                                                                                                                                                           |
| Younsi et al., 2020 <sup>12</sup>       | Not specified                                                                                                                                                                                                                                                                                                                                                                                                           |



**Supplementary Data 5.** Association between pre-operative neurological status and mortality/ poor outcome following surgical evacuation of ASDH in patients aged 60 years and above.

| Study                               | GCS                             | Outcome                      | Statistical Test                                                                     |
|-------------------------------------|---------------------------------|------------------------------|--------------------------------------------------------------------------------------|
| Jamjoom, 1992 <sup>20</sup>         | Dichotomised: $\geq 5$ vs $< 5$ | Dichotomised GOS             | Chi-squared test; NS                                                                 |
| Petridis et al., 2009 <sup>4</sup>  | Categorised: 13-15, 9-12, 3-8   | Mortality                    | Chi-squared test; $p < 0.001$                                                        |
| Raj et al., 2016 <sup>17</sup>      | Categorised: 13-15, 9-12, 3-8   | Mortality                    | Chi-squared test; $p < 0.001$                                                        |
| Benedetto et al., 2017 <sup>6</sup> | GCS                             | GOS (30 days)                | Univariate linear regression; RC 0.18, $p < 0.0001$                                  |
|                                     |                                 |                              | Multivariate linear regression; RC 0.17, $p < 0.0001$                                |
|                                     |                                 | GOS (6 months)               | Univariate linear regression; RC 0.20, $p < 0.0001$                                  |
|                                     |                                 |                              | Multivariate linear regression; RC 0.20, $p < 0.0001$                                |
| Won et al., 2017 <sup>7</sup>       | Dichotomised: $> 6$ vs $\leq 6$ | Mortality                    | Univariate logistic regression; OR 4.0, $p = 0.04$                                   |
|                                     |                                 | Dichotomised GOS (discharge) | Univariate logistic regression; OR 4.2, NS                                           |
|                                     |                                 | Dichotomised GOS (LTFU)      | Univariate logistic regression; OR 3.7, NS                                           |
| Monsivais et al., 2018 <sup>8</sup> | Dichotomised: $\geq 9$ vs $< 9$ | Mortality                    | Chi-squared test; $p = 0.01$<br>Multivariate logistic regression; OR 3.0, $p = 0.02$ |
| Akbik et al., 2019 <sup>10</sup>    | GCS (mean)                      | Mortality                    | Kruskal Wallis test; $p = 0.014$                                                     |
|                                     |                                 | Categorised GOS              | Kruskal Wallis test; $p = 0.016$                                                     |

|                                       |                                |                  |                                                       |
|---------------------------------------|--------------------------------|------------------|-------------------------------------------------------|
| Bus et al., 2019 <sup>9</sup>         | Categorised: 3-8, 9-15         | Dichotomised GOS | Chi-squared test; NS                                  |
| Trevisi et al.,<br>2020 <sup>11</sup> | GCS                            | Dichotomised GOS | Univariate logistic regression; $p < 0.001$           |
|                                       |                                |                  | Multivariate logistic regression; OR 0.87, $p = 0.04$ |
|                                       | Dichotomised: $>8$ vs $\leq 8$ | Dichotomised GOS | Chi-squared test; $p < 0.001$                         |

**Supplementary Data 6.** Association between pre-operative pupil reactivity to light and mortality/ poor outcome following surgical evacuation of ASDH in patients aged 60 years and above.

| Study                              | Pupils                                                              | Outcome                        | Statistical Test               |
|------------------------------------|---------------------------------------------------------------------|--------------------------------|--------------------------------|
| Jamjoom, 1992 <sup>20</sup>        | Non-reactive pupil(s)                                               | Dichotomised GOS               | Chi-squared test; p = 0.025    |
| Petridis et al., 2009 <sup>4</sup> | Bilaterally reactive, unilaterally reactive, bilaterally unreactive | Mortality<br>GOS (1 vs others) | Chi-squared test; p<0.001      |
| Raj et al., 2016 <sup>17</sup>     | Normal, abnormal                                                    | Mortality                      | Chi-squared test; NS           |
| Akbik et al., 2019 <sup>10</sup>   | Fixed and dilated, normal                                           | Mortality                      | Fisher's exact test; p = 0.021 |
|                                    |                                                                     | Categorised GOS                | Fisher's exact test; p = 0.009 |
| Bus et al., 2019 <sup>9</sup>      | Bilaterally dilated and unreactive                                  | Dichotomised GOS               | Fisher's exact test; p = 0.03  |
| Trevisi et al., 2020 <sup>11</sup> | Fixed pupils                                                        | Dichotomised GOS               | Chi-squared test; NS           |
| Younsi et al., 2020 <sup>12</sup>  | Anisocoria                                                          | Dichotomised GOS               | Fisher's exact test; NS        |

**Supplementary Data 7.** Summary of risk of bias assessment using ROBINS-I tool for all included studies.

|    | Study          | Cofounding | Selection | Classification | Deviation | Missing | Measurement | Reporting | Overall         |
|----|----------------|------------|-----------|----------------|-----------|---------|-------------|-----------|-----------------|
| 1  | Wilberger 1991 | Moderate   | Low       | Low            | Low       | Low     | Moderate    | Moderate  | <b>Moderate</b> |
| 2  | Cagetti 1992   | Serious    | NI        | Moderate       | Low       | Low     | Serious     | Moderate  | <b>Serious</b>  |
| 3  | Jamjoom 1992   | NI         | Low       | Low            | Low       | Low     | Moderate    | Moderate  | <b>Moderate</b> |
| 4  | Kotwica 1992   | Moderate   | Low       | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 5  | Massaro 1996   | Moderate   | Low       | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 6  | Koc 1997       | Moderate   | Low       | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 7  | Hanif 2009     | Moderate   | Low       | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 8  | Petridis 2009  | Moderate   | Low       | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 9  | Taussky 2012   | Moderate   | Low       | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 10 | Hamed 2016     | Serious    | Low       | Low            | Moderate  | Low     | Moderate    | Low       | <b>Serious</b>  |
| 11 | Merzo 2021     | Moderate   | Moderate  | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 12 | Raj 2016       | Moderate   | Moderate  | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 13 | Benedetto 2017 | Moderate   | Low       | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 14 | McGinity 2017  | Moderate   | Moderate  | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 15 | Won 2017       | Moderate   | Low       | Moderate       | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 16 | Bus 2018       | Moderate   | Low       | Low            | Low       | Low     | Moderate    | Moderate  | <b>Moderate</b> |
| 17 | Monsivai 2018  | Moderate   | Low       | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 18 | Akbik 2019     | Moderate   | Low       | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 19 | Sufaro 2019    | Serious    | Low       | Low            | Moderate  | Low     | Moderate    | Low       | <b>Serious</b>  |
| 20 | Trevisi 2020   | Moderate   | Low       | Low            | Low       | Low     | Moderate    | Low       | <b>Moderate</b> |
| 21 | Younsi 2020    | Moderate   | Low       | Low            | Low       | Serious | Moderate    | Low       | <b>Serious</b>  |

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