



## Original Research

# The 100 most cited manuscripts in emergency abdominal surgery: A bibliometric analysis



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## HIGHLIGHTS

- A Bibliometric analysis was performed, establishing the most influential publications in emergency abdominal surgery.
- Vascular surgery, risk assessment and gastrointestinal surgery are the topics most commonly cited.
- Emergency surgery for cancer and intra-abdominal sepsis are relatively poorly represented.

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## ABSTRACT

**Background:** The number of citations a scientific article receives provides a good indication of its impact within any given field. This bibliometric analysis aimed to identify the 100 most cited articles in Emergency Abdominal Surgery (EAS), to highlight key areas of interest and identify those that have most significantly shaped contemporary clinical practice in this newly evolving surgical specialty. This is of increasing relevance as concerns grow regarding the variable and suboptimal outcomes in Emergency General Surgery.

**Materials and methods:** The Thomson Reuters Web of Science database was used to search using the terms [Emergency AND Abdom\* AND Surg\*] to identify all English language, full manuscripts. Results were ranked according to citation number. The top 100 articles were further analysed by subject, author, journal, year of publication, institution, and country of origin.

**Results:** The median (range) citation number of the top 100 out of 7433 eligible papers was 131 (1569–97). The most cited paper (by Goldman et al., Massachusetts General Hospital, New England Journal of Medicine; 1569 citations) focused on cardiac risk stratification in non-cardiac surgery. The Journal of Trauma, Injury, Infection and Critical Care published the most papers and received most citations (n = 19; 2954 citations). The majority of papers were published by centres in the USA (n = 52; 9422 citations), followed by the UK (n = 13; 1816 citations). The most common topics of publication concerned abdominal aneurysm management (n = 26) and emergency gastrointestinal surgery (n = 26).

**Conclusion:** Vascular surgery, risk assessment and gastrointestinal surgery were the areas of focus for 59% of the contemporary most cited emergency abdominal surgery manuscripts. By providing the most influential references this work serves as a guide to what makes a citable emergency surgery paper.

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## 1. Introduction

Concern has been growing regarding the variable and suboptimal outcomes in Emergency General Surgery (EGS) across the United Kingdom, and in particular the high mortality associated with emergency laparotomy [1]. Consequently there has been an initiative to recognise EGS as a specialty in its own right, and to

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develop resources for dedicated research and postgraduate surgical training programmes [2,3].

The establishment of a citation rank list identifies published work that has the greatest intellectual influence [4]. A citation is received when a publication is referenced by another peer-reviewed article. Work that has the greatest impact on the scientific community is therefore likely to be cited many times. The method of citation analysis involves ranking and evaluating an article or journal based on the number of citations it receives. In addition to determining the most frequently cited articles, this analysis is also used to rank journals in terms of their impact upon the scientific and clinical community [4]. Many medical and surgical specialties have utilised the citation rank analysis to identify the most influential papers in their field, including; trauma and orthopaedic surgery [5], plastic surgery [6], general surgery [7], and oncology [8]. To date, no study has been undertaken to determine the most influential papers in the emerging field of emergency abdominal surgery (EAS). 'This bibliometric analysis aimed to determine research themes that have been most influential in developing understanding and management of EAS pathology.'

## 2. Materials and methods

The Thompson Reuters Web of Science citation indexing database was searched using the terms [Emergency AND Abdom\* AND Surg\*]. 'To ensure that a thorough search was performed, the aforementioned search terms were agreed after independent trial searches by two reviewers. The final Web of Science database interrogation was performed jointly by two researchers. The search was limited to English language, full manuscripts or abstracts, and results were ranked by citation number using the method first demonstrated by Paladugu and colleagues [7]. The 100 articles with the most citations were further analysed by subject, author, journal, year of publication, institution, and country of origin. A potential bias for this type of study is that older manuscripts have more time to accrue citations. Therefore a citation rate variable was created by divided the number of citations by the number of years since publication.

Exclusion criteria were articles in languages other than English and those in which the main focus of study was something other than EAS. Articles accruing identical numbers of citations were ranked their respective citation rates.

## 3. Results

The Web of Science database search returned 17,433 full manuscript, English language papers. Table 1 lists the 100 most cited of these papers [9–108]. All were full manuscripts, as no published abstracts were identified in the top 100 publications. The most cited article by Goldman et al. investigating cardiac risk in non-cardiac surgery was published in the *New England Journal of Medicine* in 1977 and cited 1569 times [9]. The oldest manuscripts featured in the top 100, both published in 1975, were by Stone et al. investigating intra-peritoneal bacteria cited 180 times [32], and Hicks et al. investigating survival improvement following aortic-aneurysm resection cited 158 times [48]. The most recent manuscript by Shaw et al. was a comparative study of mortality rates between different intravenous resuscitation fluids published in the *Annals of Surgery* in 2012 and cited 125 times [66].

The 100 most influential papers were across 27 journals, with the number of manuscripts per journal ranging from 1 to 19 (Table 2). The *Journal of Trauma-Injury Infection and Critical Care* published the most papers and also gained the most citations ( $n = 19$ ; 2954 citations). The journal with the highest impact factor (55.87) was The *New England Journal of Medicine*, which was the

**Table 1**  
The Top 100 cited manuscripts in Emergency Abdominal Surgery.

Rank	Citations	First author	Rank	Citations	First author
1	1569	Goldman L [9]	51	131	Torsello GB [59]
2	364	Stoppa RE [10]	52	131	Umpleby HC [60]
3	353	Alvarado A [11]	53	130	Hollier LH [61]
4	252	Voyles CR [12]	54	129	Temple CL [62]
5	247	Stone HH [13]	55	128	Shackford SR [63]
6	246	Arozullah AM [14]	56	128	Leung JWC [64]
7	244	Balogh Z [15]	57	127	Leitman IM [65]
8	235	Cruz DN [16]	58	126	Shaw AD [66]
9	233	Scalea TM [17]	59	126	Kieffer E [67]
10	218	Rozycki GS [18]	60	123	Schiederler MG [68]
11	212	Johansen K [19]	61	122	Canet J [69]
12	206	Gao F [20]	62	120	Mehta M [70]
13	205	Arozullah AM [21]	63	120	Raeburn CD [71]
14	200	Smetana GW [22]	64	119	Post S [72]
15	193	Malone AJ [23]	65	119	Gomican SP [73]
16	191	Bengtsson H [24]	66	117	Sato N [74]
17	189	Richardson JW [25]	67	116	Hallin A [75]
18	188	Lane MJ [26]	68	115	Mirvis SE [76]
19	188	Moore EE [27]	69	114	Tack D [77]
20	188	Mucha P [28]	70	113	Coleman MG [78]
21	186	Krukowski ZH [29]	71	113	Hoskin PJ [79]
22	183	Kingsnorth A [30]	72	112	Castleden WM [80]
23	181	Ertel W [31]	73	111	Bode PJ [81]
24	180	Stone HH [32]	74	108	Vieweg J [82]
25	177	Hoffmann R [33]	75	108	Pederson T [83]
26	177	Ellis H [34]	76	108	Shimazu S [84]
27	174	Limet R [35]	77	107	Hertzer NR [85]
28	173	Sauerland S [36]	78	106	Claridge JA [86]
29	173	Johnson JW [37]	79	106	Attard AR [87]
30	173	Yusuf SW [38]	80	105	Nelson R [88]
31	172	Ingoldby CJH [39]	81	104	Van Ruler O [89]
32	170	Feliciano DV [40]	82	104	Tiwari A [90]
33	169	Djokovic JL [41]	83	104	Bjorck M [91]
34	167	Tso P [42]	84	103	Alsac JM [92]
35	166	Rothlin MA [43]	85	103	Smothers L [93]
36	166	Fowkes FGR [44]	86	103	Dolich MO [94]
37	161	Regel G [45]	87	103	Ernst GB [95]
38	160	Pacelli F [46]	88	102	Kaplan GG [96]
39	160	Kashuk JL [47]	89	102	Peppelenbosch N [97]
40	158	Hicks GL [48]	90	102	Bode PJ [98]
41	157	Clarke JR [49]	91	102	Chassin JL [99]
42	153	Kortbeek JB [50]	92	101	Fuks D [100]
43	151	Liu M [51]	93	101	Oldham KT [101]
44	150	Sugrue M [52]	94	99	Trowbridge RL [102]
45	147	Gloviczki P [53]	95	99	Irvin TT [103]
46	143	Runkel NS [54]	96	99	Feliciano DV [104]
47	140	Kimura A [55]	97	99	Lawrie GM [105]
48	134	Crawford JL [56]	98	98	Branney SW [106]
49	133	Kurtz RJ [57]	99	97	Moore R [107]
50	131	Schochl H [58]	100	97	Berci G [108]

journal of publication of the most cited article [9].

The country with the greatest number of publications in the top 100 was the United States of America (USA;  $n = 52$ ; 9422 citations) followed by the United Kingdom (UK;  $n = 13$ ; 1929 citations). The Massachusetts General Hospital had the most citations with 1569, whereas the institution with the largest number of manuscripts in the top 100 was Baylor College of Medicine, Houston, with 4 articles. No first author had more than 2 manuscripts in the top 100 (Arozullah AM [14,21], Bode PJ [81,98], Feliciano DV [40,104], Stone HH [13,32]). Similarly, only three senior authors had more than one manuscript and none more than two (Herfarth C [54,72], Trentz O [31,43], Tscherne H [33,45]).

The citation rate for the top 10 manuscripts ranged from 40 for Goldman et al. (Multifactorial index of cardiac risk in non-cardiac surgical procedures) [9] to 17 for Sauerland et al. (Laparoscopy for abdominal emergencies - evidence-based guidelines of the European Association for Endoscopic Surgery) (Table 3) [36]. The USA had the most papers in the top 10 citation rate with 4, the UK,

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