



One Hundred Citation Classics in General Surgical Journals

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Abstract. The number of times an article is cited in scientific journals reflects its impact on a specific biomedical field or specialty and reflects the impact of the authors' creativity. Our objective was to identify and analyze the characteristics of the 100 most frequently cited articles published in journals dedicated to general surgery and its close subspecialties. Using the database (1945–1995) of the Science Citation Index of the Institute for Scientific Information, 1500 articles cited 100 times and more were identified and the top 100 articles selected for further analysis. The 100 articles were published between 1931 and 1990, with more than two-thirds of them published after 1960. The mean number of citations per article was 405, (range 278–1013). Altogether, 84 of the articles originated from North America (USA 78, Canada 6) and the UK (12). New York State led the list of U.S. states with 14, and Harvard and Columbia University led the list of institutions with 6 articles each. The 100 articles were published in 10 surgical journals led by the *Annals of Surgery* ($n = 40$), followed by *Surgery* ($n = 15$), *Archives of Surgery* ($n = 12$), *Surgery, Gynecology and Obstetrics* ($n = 11$), and *British Journal of Surgery* ($n = 10$). A total of 80 of the articles reported clinical experiences, 6 were clinical review articles, and 14 dealt with basic science. Eighteen articles reported a new surgical technique and six a prosthetic device. Gastrointestinal surgery and trauma and critical care led the list of the surgical fields, each with 25 articles, followed by vascular surgery ($n = 15$). Thirty-four persons authored two or more of the top-cited articles. This list of the top-cited papers identifies seminal contributions and their originators, facilitating the understanding and discourse of modern surgical history and offering surgeons hints about what makes a contribution a “top-cited classic.” To produce such a “classic” the surgeon and his or her group must come up with a clinical or nonclinical innovation, observation, or discovery that has a long-standing effect on the way we practice—be it operative or nonoperative. Based on our findings, to be well cited such a contribution should be published in the English language in a high-impact journal. Moreover, it is more likely to resonant loudly if it originates from a North American or British “ivory tower.”

The acknowledgment that one article gives to another is a reference; the acknowledgment that one article receives from another is a citation. Citation analysis is that area of bibliometrics that deals with the study of these relations. The number of times an article is cited in scientific journals measures its impact on a specific biomedical field or a specialty; it also reflects the impact of the author(s)' creativity. Moreover, scientific journals attract well cited authors and desire potentially well cited manu-

scripts—as the more cited the articles they publish, the higher is the impact factor of the journal.

There were a few recent attempts to identify and analyze “the most cited articles” in various specialties. Garfield in 1987 listed the “top 100” best-cited articles ever published in *JAMA* [1], and in 1993 Dubin et al. identified 129 articles that had been cited 100 or more times in leading dermatologic journals [2]. In 1999 Pickett and Davis listed the 100 most-cited articles from the *Journal of Molecular Biology* [3]. Such “best-seller” lists focus our attention on “classic” or “landmark” contributions and their respective contributors, allowing us to better understand what qualities an article requires to be included in such a list. In this communication we identify and analyze the characteristics of the top 100 most frequently cited articles published in journals dedicated to general surgery and its close subspecialties during 1945–1995.

Materials and Methods

The 100 most frequently cited articles in journals dedicated to general surgery and its subspecialties (Table 1) were identified using the database (1945–1995) of the Science Citation Index of the Institute for Scientific Information. More than 1500 articles were cited 100 times and more, and the top 100 articles from this list were selected for further analysis (Table 2). The articles were obtained, reviewed, and analyzed according to the publishing journal; authorship; institution; state, country, and year of publication; type of article (e.g., basic science, clinical research); surgical category; and field of medicine.

Results

The 100 articles are listed in Table 2 in descending order, according to the number of citations they received. The mean number of citations per article was 405. The most cited article received 1013 citations, and the least-cited article received 278 citations.

These articles were published from 1931 to 1990. The oldest article was published in 1931 (Huggins, *Archives of Surgery*, 1931) and the most recent article in 1990 (Dubois, *Annals of Surgery*, 1990). More than two-thirds of the articles were published after 1960.

Table 1. List of screened journals.

<i>Acta Chirurgica Belgica</i>
<i>American Journal of Proctology, Gastroenterology and Colon and Rectal Surgery</i>
<i>American Journal of Surgery</i>
<i>American Surgeon</i>
<i>Annals Chirurgie</i>
<i>Annals of Royal College of Surgeons of England</i>
<i>Annals of Surgery</i>
<i>Archives of Surgery</i>
<i>Australian and New Zealand Journal of Surgery</i>
<i>British Journal of Surgery</i>
<i>Burns</i>
<i>Canadian Journal of Surgery</i>
<i>Chirurg</i>
<i>Chirurgia Gastroenterology</i>
<i>Current Opinion In General Surgery</i>
<i>Current Problems In Surgery</i>
<i>Current Surgery</i>
<i>Digestive Surgery</i>
<i>Diseases of Colon And Rectum</i>
<i>Endoscopy</i>
<i>Endoscopic Surgery and Allied Technologies</i>
<i>European Journal of Surgery</i>
<i>European Surgical Research</i>
<i>Experimental Medicine and Surgery</i>
<i>Hepatogastroenterology</i>
<i>HPB Surgery</i>
<i>Industrial Medicine and Surgery</i>
<i>Injury</i>
<i>International Surgery</i>
<i>Japanese Journal of Surgery</i>
<i>Journal of Chirurgie (Paris)</i>
<i>Journal of American College of Surgeons (previously Surgery, Gynecology and Obstetrics)</i>
<i>Journal of Clinical Laser Medicine and Surgery</i>
<i>Journal of Gastrointestinal Surgery</i>
<i>Journal of Hepato-Biliary-Pancreatic Surgery</i>
<i>Journal of Image Guided Surgery</i>
<i>Journal of Investigative Surgery</i>
<i>Journal of Laparoendoscopic Surgery</i>
<i>Journal of Laparoendoscopic Advances</i>
<i>Journal Royal College of Surgeons of Edinburgh</i>
<i>Journal of Surgical Research</i>
<i>Journal of Trauma</i>
<i>Langenbeck's Archives of Surgery</i>
<i>Lasers in Surgery and Medicine</i>
<i>Major Problems In Clinical Surgery</i>
<i>Minimal Invasive Therapy</i>
<i>Modern Trends in Surgery</i>
<i>Netherlands Journal of Surgery</i>
<i>Obesity Surgery</i>
<i>Pacific Medicine and Surgery</i>
<i>Philippine Journal of Surgery and Surgical Specialties</i>
<i>Progress in Surgery</i>
<i>Review of Surgery</i>
<i>Same-Day Surgery</i>
<i>Seminars in Laparoscopic Surgery</i>
<i>Shock</i>
<i>South African Journal of Surgery</i>
<i>Surgery</i>
<i>Surgery Annual</i>
<i>Surgical Clinics of North America</i>
<i>Surgical Endoscopy</i>
<i>Surgical Laparoscopy and Endoscopy</i>
<i>Surgery Today</i>
<i>Swiss Surgery</i>
<i>World Journal of Surgery</i>

The 100 articles originated from six countries: United States ($n = 78$), United Kingdom ($n = 12$), Canada ($n = 6$), France ($n = 2$), Sweden ($n = 1$), and Uganda ($n = 1$). The U.S. publications derived from 23 states; leading was the state of New York (with 14 articles) followed by Massachusetts ($n = 6$), Michigan ($n = 6$), Pennsylvania ($n = 6$), District of Columbia ($n = 5$), and Ohio ($n = 5$).

Altogether, 57 institutions produced these 100 top-cited articles. The leading 12 appear in Table 3, with Harvard University in Boston (6 publications), Columbia University in New York (6 publications), and the University of Pennsylvania in Philadelphia (5 publications) leading the list. Of the total articles, 12 came from multiinstitutional collaboration, 1 from multinational collaboration, and 87 from individual institutions.

The top-cited articles were published in 10 surgical journals (Table 4), led by the *Annals of Surgery* ($n = 40$) followed by *Surgery* ($n = 15$), *Archives of Surgery* ($n = 12$), *Surgery, Gynecology and Obstetrics* (journal of the American College of Surgeons) ($n = 11$), and *British Journal of Surgery* ($n = 10$).

Of the 100 articles, 80 reported clinical experience, 6 were clinical review articles, and 14 dealt with basic science. Considerable attention was given to articles on new surgical techniques ($n = 18$) or prosthetic devices ($n = 6$). The general issues concerning the top 100 articles are summarized in Table 5. Gastrointestinal surgery and trauma and critical care led the list of the surgical fields, each with 25 articles, followed by vascular surgery ($n = 15$) (Table 6).

Thirty-four persons authored two or more of the top-cited articles. Table 7 lists "frequent authors" of three articles and those who authored two articles (as the first author of both). Drs. Szilagyi (vascular surgery), Kakkar (venous thrombosis), and Mullen and Fischer (surgical nutrition) top the list.

Discussion

The number of times articles are cited in other articles is widely used to measure the impact of journals and to assess the quality of contributions by individual authors. Are we to assume therefore that the 100 top-cited articles in the general surgical literature represent "real classics" or "landmark" articles? What do we learn from this analysis?

Browsing through the top-100 list one notes that among the many true-landmark contributions there are articles dealing with a topic that was "hot," or popular, at one time and then ceased to be so. It has been claimed that with increasing age each paper has more time to be cited [3], but in our analysis 77 of the top-cited papers appeared after 1960. As time passes, however, even "true classics" are gradually being cited less often because their substance has been absorbed by the current knowledge—a phenomenon called "obliteration by incorporation" [1]. Thus the absolute number of citations an article has accumulated cannot be used as a sole measurement of its "importance." As Garfield [1] noted, the landmark article by Sabin et al. from 1960 [4] on the use of oral poliomyelitis virus vaccine received only 90 citations up to 1987. As Picknett and Davis [3] suggested, often the true intellectual milestones may be found in the reference lists of the top-cited papers.

Interestingly, the title of an individual top-cited paper does not always divulge the reason the article is a "bestseller." Thus the number 1 article on this list (by Pugh et al.) has not been cited

Table 2. Top 100 citation classics.

Rating	Article	No. of citations
1	Pugh RN, Murray-Lyon IM, Dawson JL, Pietroni MC, Williams R. Transection of the oesophagus for bleeding oesophageal varices. <i>Br. J. Surg.</i> 1973;60:646–649	1013
2	Zollinger RM, Ellison EH. Primary peptic ulcerations of the jejunum associated with islet cell tumors of the pancreas. <i>Ann. Surg.</i> 1955;142:709–728	958
3	Baker SP, O'Neill B, Haddon W Jr, Long WB. The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care. <i>J. Trauma</i> 1974;14:187–196	948
4	Breslow A. Thickness, cross-sectional areas and depth of invasion in the prognosis of cutaneous melanoma. <i>Ann. Surg.</i> 1970;172:902–908	815
5	Batson OV. The function of the vertebral veins and their role in the spread of the metastases. <i>Ann. Surg.</i> 1940;112:138–149	784
6	Burke JF. The effective period of preventive antibiotic action in experimental incisions and dermal lesions. <i>Surgery</i> 1961;50:161–168	779
7	Dudrick SJ, Wilmore DW, Vars HM, Rhoads JE. Long-term total parenteral nutrition with growth, development, and positive nitrogen balance. <i>Surgery</i> 1968;64:134–142	761
8	Staub NC, Bland RD, Brigham KL, Demling R, Erdmann AJ 3rd, Woolverton WC. Preparation of chronic lung lymph fistulas in sheep. <i>J. Surg. Res.</i> 1975;19:315–320	630
9	King H, Shumavker H. Splenic studies. I. Susceptibility to infection after splenectomy performed in infancy. <i>Ann. Surg.</i> 1952;136:239–242	605
10	Bricker EM. Bladder substitution after pelvic evisceration. <i>Surg. Clin. North Am.</i> 1950;30:1511–1521	544
11	Flanc C, Kakkar VV, Clarke MB. The detection of venous thrombosis of the legs using 125-I-labelled fibrinogen. <i>Br. J. Surg.</i> 1968;55:742–747	536
12	Stout AP, Murray MR. Hemangiopericytoma: a vascular tumor featuring Zimmermann's pericytes. <i>Ann. Surg.</i> 1942;116:26–33	532
13	Freund HR, James JH, Fischer JE. Nitrogen-sparing mechanisms of singly administered branched-chain amino acids in the injured rat. <i>Surgery</i> 1981;90:237–243	528
14	Astler VB, Collier FA. The prognostic significance of direct extension of carcinoma of the colon and rectum. <i>Ann. Surg.</i> 1954;139:846–852	518
15	Allison PR. Reflux esophagitis, sliding hiatal hernia, and the anatomy of repair. <i>Surg. Gynecol. Obstet.</i> 1951;92:419–431	505
16	Rabinov K, Paulin S. Roentgen diagnosis of venous thrombosis in the leg. <i>Arch. Surg.</i> 1972;104:134–144	494
17	Lillehei RC, Longbeam JK, Bloch JH, Manax WG. The nature of irreversible shock: experimental and clinical observations. <i>Ann. Surg.</i> 1964;160:682–710	478
18	Burkitt D. A sarcoma involving the jaws in African children. <i>Br. J. Surg.</i> 1958;46:218–223	478
19	Warren WD, Zeppa R, Fomon JJ. Selective trans-splenic decompression of gastroesophageal varices by distal splenorenal shunt. <i>Ann. Surg.</i> 1967;166:437–455	473
20	Debaeky ME, Simeone FA. Battle injuries of the arteries in World War II: an analysis of 2,471 cases. <i>Ann. Surg.</i> 1946;123:534–579	467
21	Morton D, Eilber FR, Malmgren RA, Wood WC. Immunological factors which influence response to immunotherapy in malignant melanoma. <i>Surgery</i> 1970;68:158–163	463
22	Polk HC Jr, Lopez-Mayor JF. Postoperative wound infection: a prospective study of determinant factors and prevention. <i>Surgery</i> 1969;66:97–103	463
23	Morton DL, Malmgren RA, Holmes EC, Ketcham AS. Demonstration of antibodies against human malignant melanoma by immunofluorescence. <i>Surgery</i> 1968;64:233–240	454
24	Barrett NR. Chronic peptic ulcer of the oesophagus and oesophagitis. <i>Br. J. Surg.</i> 1950;38:175–182	447
25	Woolner LB, Beahrs OJ, Black M, McConahey WM, Keating FR. Classification and prognosis of thyroid carcinoma. <i>Am. J. Surg.</i> 1961;102:354–386	446
26	Huggins C, Stevens RE, Hodges CV. Studies on prostate cancer. II. The effects of castration on advanced carcinoma of the prostate gland. <i>Arch. Surg.</i> 1941;43:209–223	446
27	Cushing H. Peptic ulcers and the interbrain. <i>Surg. Gynecol. Obstet.</i> 1932;55:1–34	439
28	Cruse PJ, Foord R. A five-year prospective study of 23,649 surgical wounds. <i>Arch. Surg.</i> 1973;107:206–210	435
29	Rosenberg SA, Lotze MT, Yang JC, Aebersold PM, Linehan WM, Seipp CA, White DE. Experience with the use of high-dose interleukin-2 in the treatment of 652 cancer patients. <i>Ann. Surg.</i> 1989;210:474–484	427
30	Nadler SB, Hidalgo JU, Bloch T. Prediction of blood volume in normal human adults. <i>Surgery</i> 1962;51:224–232	427
31	Ellison EH, Wilson SD. The Zollinger-Ellison syndrome. <i>Ann. Surg.</i> 1964;160:512–530	417
32	Wilmore DW, Long JM, Mason AD Jr, Skreen RW, Pruitt BA Jr. Catecholamines: mediator of the hypermetabolic response to thermal injury. <i>Ann. Surg.</i> 1974;180:653–669	415
33	Creech O, Kremenz ET, Ryan RF, Winblad JN. Chemotherapy of cancer: regional perfusion utilizing an extracorporeal circuit. <i>Ann. Surg.</i> 1958;148:616–632	413
34	Sevitt S, Gallagher N. Venous thrombosis and pulmonary embolism: a clinico-pathological study in injured and burned patients. <i>Br. J. Surg.</i> 1961;48:475–489	408
35	Earlam R, Cunha-Melo JR. Oesophageal squamous cell carcinoma. I. A critical review of surgery. <i>Br. J. Surg.</i> 1980;67:381–390	399
36	Negus D, Pinto DJ, Le Quesne LP, Brown N, Chapman M. 125-I-labelled fibrinogen in the diagnosis of deep-vein thrombosis and its correlation with phlebography. <i>Br. J. Surg.</i> 1968;55:835–839	396
37	Tracey KJ, Lowry SF, Fahey TJ 3rd, Albert JD, Fong Y, Hesse D, Beutler B, Manogue KR, Calvano S, Wei H, et al. Cachectin/tumor necrosis factor induces lethal shock and stress hormone responses in the dog. <i>Surg. Gynecol. Obstet.</i> 1987;164:415–422	394
38	Turnbull RB Jr, Kyle K, Watson FR, Spratt J. Cancer of the colon: the influence of the no-touch isolation technic on survival rates. <i>Ann. Surg.</i> 1967;166:420–427	393
39	Payne JH, DeWind LT. Surgical treatment of obesity. <i>Am. J. Surg.</i> 1969;118:141–147	392

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Table 2. (Continued)

Rating	Article	No. of citations
40	Marshall VF, Marchetti AA, Krantz KE. The correction of stress incontinence by simple vesicourethral suspension. <i>Surg. Gynecol. Obstet.</i> 1949;88:509–518	390
41	Whipple AO, parsons WB, Mullins CR. Treatment of carcinoma of the ampulla of Vater. <i>Ann. Surg.</i> 1935;102:763–779	382
42	Hickman RO, Buckner CD, Clift RA, Sanders JE, Stewart P, Thomas ED. A modified right atrial catheter for access to the venous system in marrow transplant recipients. <i>Surg. Gynecol. Obstet.</i> 1979;148:871–875	379
43	Hesse DG, Tracey KJ, Fong Y, Manogue KR, Palladino MA Jr, Cerami A, Shires GT, Lowry SF. Cytokine appearance in human endotoxemia and primate bacteremia. <i>Surg. Gynecol. Obstet.</i> 1988;166:147–153	378
44	Ballinger WF, Lacy PE. Transplantation of intact pancreatic islets in rats. <i>Surgery</i> 1972;72:175–186	374
45	Starr A, Edwards ML. Mitral replacement: clinical experience with a ball-valve prosthesis. <i>Ann. Surg.</i> 1961;154:726–740	372
46	Klopp CT, Alford TC, Bateman J, Berry GN, Winship T. Fractionated intra-arterial cancer: chemotherapy with methyl hydrochloride: a preliminary report. <i>Ann. Surg.</i> 1950;132:811–833	372
47	Bigelow WG, Lindsay WK, Greenwood WF. Hypothermia: its possible in cardiac surgery: an investigation of factors governing survival in dogs at low body temperatures. <i>Ann. Surg.</i> 1950;132:849–867	370
48	Ranson JH, Rifkind KM, Roses DF, Fink SD, Eng K, Spencer FC. Prognostic signs and the role of operative management in acute pancreatitis. <i>Surg. Gynecol. Obstet.</i> 1974;139:69–81	366
49	Fischer JE, Rosen HM, Ebeid AM, James JH, Keane JM, Soeters PB. The effect of normalization of plasma amino acids on hepatic encephalopathy in man. <i>Surgery</i> 1976;80:77–91	365
50	Broviac JW, Cole JJ, Scribner BH. A silicone rubber atrial catheter for prolonged parenteral alimentation. <i>Surg. Gynecol. Obstet.</i> 1973;136:602–606	365
51	Whipple AO. The problem of portal hypertension in relation to the hepatosplenopathies. <i>Ann. Surg.</i> 1945;122:449–475	361
52	Wichterman KA, Baue AE, Chaudry IH. Sepsis and septic shock—a review of laboratory models and a proposal. <i>J. Surg. Res.</i> 1980;29:189–201	357
53	Meakins JL, Pietsch JB, Bubenick O, Kelly R, Rode H, Gordon J, MacLean LD. Delayed hypersensitivity: indicator of acquired failure of host defenses in sepsis and trauma. <i>Ann. Surg.</i> 1977;186:241–250	354
54	Fry DE, Pearlstein L, Fulton RL, Polk HC Jr. Multiple system organ failure: the role of uncontrolled infection. <i>Arch. Surg.</i> 1980;115:136–140	354
55	Kakkar V. The diagnosis of deep vein thrombosis using the ¹²⁵ I fibrinogen test. <i>Arch. Surg.</i> 1972;104:152–159	353
56	Fisher B, Slack N, Katrych D, Wolmark N. Ten year follow-up results of patients with carcinoma of the breast in a co-operative clinical trial evaluating surgical adjuvant chemotherapy. <i>Surg. Gynecol. Obstet.</i> 1975;140:528–534	344
57	Szilagyi DE, Elliott JP, Hageman JH, Smith RF, Dall'olmo CA. Biologic fate of autogenous vein implants as arterial substitutes: clinical, angiographic and histopathologic observations in femoro-popliteal operations for atherosclerosis. <i>Ann. Surg.</i> 1973;178:232–246	338
58	Salvatierra O Jr, Vincenti F, Amend W, Potter D, Iwaki Y, Opelz G, Terasaki P, Duca R, Cochrum K, Hanes D, Stoney RJ, Feduska NJ. Deliberate donor-specific blood transfusions prior to living related renal transplantation: a new approach. <i>Ann. Surg.</i> 1980;192:543–552	336
59	Breslow A. Tumor thickness, level of invasion and node dissection in stage I cutaneous melanoma. <i>Ann. Surg.</i> 1975;182:572–575	336
60	Buzby GP, Mullen JL, Matthews DC, Hobbs CL, Rosato EF. Prognostic nutritional index in gastrointestinal surgery. <i>Am. J. Surg.</i> 1980;139:160–167	331
61	Demeester TR, Johnson LF, Joseph GJ, Toscano MS, Hall AW, Skinner DB. Patterns of gastroesophageal reflux in health and disease. <i>Ann. Surg.</i> 1976;184:459–470	331
62	Johnston D, Wilkinson AR. Highly selective vagotomy without a drainage procedure in the treatment of duodenal ulcer. <i>Br. J. Surg.</i> 1970;57:289–296	325
63	Szilagyi DE, Smith RF, Elliott JP, Vrandecic MP. Infection in arterial reconstruction with synthetic grafts. <i>Ann. Surg.</i> 1972;176:321–333	323
64	Lee WH, Krumhaar D, Fonkalsrud EW, Schjeide OA, Maloney JV. Denaturation of plasma proteins as a cause of morbidity and death after intracardiac operations. <i>Surgery</i> 1961;50:29–39	321
65	Slade MS, Simmons RL, Yunis E, Greenberg LJ. Immunodepression after major surgery in normal patients. <i>Surgery</i> 1975;78:363–372	321
66	Mustard WT. Successful two-stage correction of transposition of the great vessels. <i>Surgery</i> 1964;55:469–472	319
67	Reddick EJ, Olsen DO. Laparoscopic laser cholecystectomy: a comparison with mini-lap cholecystectomy. <i>Surg. Endosc.</i> 1989;3:131–133	317
68	Kock NG. Intra-abdominal “reservoir” in patients with permanent ileostomy: preliminary observations on a procedure resulting in fecal “continence” in five ileostomy patients. <i>Arch. Surg.</i> 1969;99:223–231	315
69	Hertzner NR, Beven EG, Young JR, O'Hara PJ, Ruschhaupt WF 3rd, Graor RA, Dewolfe VG, Maljovec LC. Coronary artery disease in peripheral vascular patients: a classification of 1000 coronary angiograms and results of surgical management. <i>Ann. Surg.</i> 1984;199:223–233	312
70	Dubois F, Icard P, Berthelot G, Levard H. Coelioscopic cholecystectomy: preliminary report of 36 cases. <i>Ann. Surg.</i> 1990;211:60–62	311
71	Mullen JL, Buzby GP, Matthews DC, Smale BF, Rosato EF. Reduction of operative morbidity and mortality by combined preoperative and postoperative nutritional support. <i>Ann. Surg.</i> 1980;192:604–613	310
72	Fischer JE, Funovics JM, Aguirre A, James JH, Keane JM, Wesdorp RI, Yoshimura N, Westman T. The role of plasma amino acids in hepatic encephalopathy. <i>Surgery</i> 1975;78:276–290	310
73	Siegel JH, Greenspan M, Del Guercio LR. Abnormal vascular tone, defective oxygen transport and myocardial failure in human septic shock. <i>Ann. Surg.</i> 1967;165:504–517	308
74	Stout AP. Hemangio-endothelioma: a tumor of blood vessels featuring vascular endothelial cells. <i>Ann. Surg.</i> 1943;118:445–464	303
75	Stone HH, Hooper CA, Kolb LD, Geheber CE, Dawkins EJ. Antibiotic prophylaxis in gastric, biliary and colonic surgery. <i>Ann. Surg.</i> 1976;184:443–452	303

(Continued)

Table 2. (Continued)

Rating	Article	No. of citations
76	MacLean LD, Mulligan WG, McLean AP, Duff JH. Patterns of septic shock in man—a detailed study of 56 patients. <i>Ann. Surg.</i> 1967;166:543–562	303
77	Johnston GW, Rodgers HW. A review of 15 years' experience in the use of sclerotherapy in the control of acute haemorrhage from oesophageal varices. <i>Br. J. Surg.</i> 1973;60:797–800	303
78	Fogarty TJ, Cranley JJ, Krause RJ, Strasser ES, Hafner CD. A method for extraction of arterial emboli and thrombi. <i>Surg. Gynecol. Obstet.</i> 1963;116:241–244	302
79	Askanazi J, Carpentier YA, Elwyn DH, Nordenstrom J, Jeevanandam M, Rosenbaum SH, Gump FE, Kinney JM. Influence of total parenteral nutrition on fuel utilization in injury and sepsis. <i>Ann. Surg.</i> 1980;191:40–46	301
80	Dubost C, Allary M, Oeconomos N. Resection of an aneurysm of the abdominal aorta: reestablishment of the continuity by a preserved human arterial graft, with result after five months. <i>Arch. Surg.</i> 1952;64:405–408	299
81	Jaffe HL, Lichtenstein L. Solitary unicameral bone cyst, with emphasis on the roentgen picture, the pathologic appearance and the pathogenesis. <i>Arch. Surg.</i> 1942;44:1004–1025	298
82	Jaffe BM, Donegan WL, Watson F, Spratt JS Jr. Factors influencing survival in patients with untreated hepatic metastases. <i>Surg. Gynecol. Obstet.</i> 1968;127:1–11	298
83	Jackson FC, Perrin EB, Felix WR, Smith AG. A clinical investigation of the portacaval shunt. V. Survival analysis of the therapeutic operation. <i>Ann. Surg.</i> 1971;174:672–701	297
84	Leveen HH, Christoudias G, Ip M, Luft R, Falk G, Grosberg S. Peritoneo-venous shunting for ascites. <i>Ann. Surg.</i> 1974;180:580–591	295
85	Cournand A, Riley RL, Bradley SE, Breed ES, Noble RP, Lauson HD, Gregersen MI, Richards DW. Studies of the circulation in clinical shock. <i>Surgery</i> 1943;13:964–995	295
86	Cruse PJ, Foord R. The epidemiology of wound infection: a 10-year prospective study of 62,939 wounds. <i>Surg. Clin. North Am.</i> 1980;60:27–40	292
87	Szilagyi DE, Smith RF, DeRusso FJ, Elliott JP, Sherrin FW. Contribution of abdominal aortic aneurysmectomy to prolongation of life. <i>Ann. Surg.</i> 1966;164:678–699	291
88	Carrico CJ, Meakins JL, Marshall JC, Fry D, Maier RV. Multiple-organ-failure syndrome. <i>Arch. Surg.</i> 1986;121:196–208	291
89	Thompson JE, Austin DJ, Patman RD. Carotid endarterectomy for cerebrovascular insufficiency: long-term results in 592 patients followed up to thirteen years. <i>Ann. Surg.</i> 1970;172:663–679	290
90	Lucas CE, Sugawa C, Riddle J, Rector F, Rosenberg B, Walt AJ. Natural history and surgical dilemma of “stress” gastric bleeding. <i>Arch. Surg.</i> 1971;102:266–273	290
91	Powers SR Jr, Mannal R, Neclerio M, English M, Marr C, Leather R, Ueda H, Williams G, Custead W, Dutton R. Physiologic consequences of positive end-expiratory pressure (PEEP) ventilation. <i>Ann. Surg.</i> 1973;178:265–272	287
92	Mullen JL, Gertner MH, Buzby GP, Goodhart GL, Rosato EF. Implications of malnutrition in the surgical patient. <i>Arch. Surg.</i> 1979;114:121–125	287
93	Balch CM, Murad TM, Soong SJ, Ingalls AL, Halpern NB, Maddox WA. A multifactorial analysis of melanoma: prognostic histopathological features comparing Clark's and Breslow's staging methods. <i>Ann. Surg.</i> 1978;188:732–742	286
94	Kakkar VV, Howe CT, Nicolaidis AN, Renney JT, Clarke MB. Deep vein thrombosis of the leg: is there a “high risk” group? <i>Am. J. Surg.</i> 1970;120:527–530	285
95	Goligher JC, Graham NG, De Dombal FT. Anastomotic dehiscence after anterior resection of rectum and sigmoid. <i>Br. J. Surg.</i> 1970;57:109–118	283
96	Conn JW, Knopf RF, Nesbit RM. Clinical characteristics of primary aldosteronism from an analysis of 145 cases. <i>Am. J. Surg.</i> 1964;107:159–172	282
97	Schumer W. Steroids in the treatment of clinical septic shock. <i>Ann. Surg.</i> 1976;184:333–341	281
98	Monchik GJ, Russell PS. Transplantation of small bowel in the rat: technical and immunological considerations. <i>Surgery</i> 1971;70:693–702	279
99	Anderson RP, Bonchek LI, Grunkemeier GL, Lambert LE, Starr A. The analysis and presentation of surgical results by actuarial methods. <i>J. Surg. Res.</i> 1974;16:224–230	279
100	Huggins CB. The formation of bone under the influence of epithelium of the urinary tract. <i>Arch. Surg.</i> 1931;22:377–408	278

1013 times because it describes esophageal transection for bleeding esophageal varices but because it introduces a novel modification of Child's clinical classification of portal hypertension.

The list of the top-cited articles identifies authors and topics that reflect major advances in general surgery over the last 50 years; in fact, it is another way to look at the unfolding of recent surgical history. Moving down the list we find at number 2 Zollinger and Ellison and “their syndrome”; then comes Baker (no. 3) with her injury severity score, Breslow (no. 4) with his grading system for malignant melanoma, Batson (no. 5) with the explanation of how vertebral metastases develop, and Burke (no. 6) with his seminal work on antibiotic prophylaxis. Dudrick (no. 7) introduced total parenteral nutrition; Astler and Collier (no. 14) offered a revised Dukes' classification system for colorectal carcinoma; Burkitt (no. 18) described the lymphoma named after him;

Warren (no. 19) presented his selective splenorenal shunt for bleeding varices; DeBakey (no. 20) outlined his World War II experience with vascular injuries; Polk (no. 22) dealt with the prevention of wound infection; Morton (no. 23) suggested immunotherapy for melanoma; Barrett (no. 24) discussed what is now called Barrett's esophagus; Cushing (no. 27) talked about stress—Cushing's ulcers; Rosenberg (no. 29) discussed the role of interleukins in cancer patients; Creech (no. 33) introduced regional perfusion therapies for cancer; Turnbull (no. 38) described his “no-touch” technique for colonic cancer; and Marshall (no. 40) offered his operation for stress incontinence. Whipple (no. 41) introduced “his” pancreatic resection, Hickman (no. 42) “his” venous access catheter, Starr (no. 45) “his” artificial mitral valve, Ranson (no. 48) “his” criteria in acute pancreatitis, and Broviac (no. 50) “his” venous catheter. Fry (no. 54) defined multiple

Table 3. Institutions of origin.

Rank	Institution	No. of articles
1	Harvard Medical School (Boston)	6
2	Columbia University, Presbyterian Hospital (New York)	6
3	University of Pennsylvania (Philadelphia)	5
4	Kings College Hospital Medical School (London)	4
5	George Washington University School of Medicine (Washington, DC)	3
6	University of Chicago Pritzker School of Medicine (Chicago)	3
7	Washington University School of Medicine (St. Louis, Columbia)	3
8	New York-Cornell Hospital, Cornell University Medical College (New York)	3
9	University of Washington (Seattle)	3
10	National Cancer Institute (Bethesda)	3
11	Henry Ford Hospital (Detroit)	3
12	The General Infirmary (Leeds, UK)	3

Table 4. Journals in which the top-cited 100 articles were published.

Rank	Journal	No. of articles
1	<i>Annals of Surgery</i>	40
2	<i>Surgery</i>	15
3	<i>Archives of Surgery</i>	12
4	<i>Surgery, Gynecology and Obstetrics</i>	11
5	<i>British Journal of Surgery</i>	10
6	<i>American Journal of Surgery</i>	5
7	<i>Journal of Surgical Research</i>	3
8	<i>Surgical Clinics of North America</i>	2
9	<i>Journal of Trauma</i>	1
10	<i>Surgery Endoscopy and Ultrasound</i>	1

system organ failure; Kakkar (no. 55) introduced effective prophylaxis for deep vein thrombosis; Fisher (no. 56) advocated breast-conserving surgery; Szilagyi (no. 57) studied the use of veins for peripheral bypass arterial surgery; DeMeester (no. 61) discussed gastroesophageal reflux disease; and Johnston (no. 62) described his experience with highly selective vagotomy. Reddick (no. 67) and Dubois (no. 70) introduced laparoscopic cholecystectomy; Hertzner (no. 69) studied the pattern of coronary disease in aortic aneurysm patients; Siegel (no. 73) and MacLean (no. 76) better defined the pathophysiology of septic shock; Fogarty (no. 78) discovered "his" embolectomy catheter and Leveen (no. 84) "his" venoperitoneal shunt. Thompson (no. 89) presented long-term results with carotid endarterectomy; and Goligher (no. 95) reported on the dehiscence of colorectal anastomoses.

This top-100 list may be criticized on a few accounts. By including subspecialty articles (e.g., vascular surgery) published in general surgical journals but not including "pure" subspecialty journals (e.g., *Journal of Vascular Surgery*), top-cited subspecialty papers may have been excluded from this list. Similarly, by excluding journals dedicated to the field of transplantation, this list misses crucial surgical events such as the advent of renal and hepatic transplantation. This is the reason Thomas Starzl—the most published (more than 1000 articles on MEDLINE) and cited (26,456 citations from 1981 to 1998) physician in the world—did

Table 5. General issues.

Subject	No. of articles
Technique	18
Prognosis/risk factors	15
Pathophysiology	13
Outcomes	12
Nonoperative management	9
Biochemistry/metabolism	6
Pathology	7
Microbiology	7
Investigations	5
Physiology	4
Immunology/cytokines	2
Laboratory model	1
Biostatistics	1

Table 6. Specific fields.

Field	No. of citations
Gastrointestinal surgery	25
Trauma and critical care	25
Vascular surgery	15
Surgical oncology (breast, soft tissues, skin)	11
Surgical infections	9
Transplantation	3
Urology	3
Heart surgery	2
Orthopedics	2
Thyroid surgery	2
Obesity	1
Thoracic surgery	1
Statistics	1

Table 7. Frequent authors.

Author	No. of articles	Position on the authors' list
Szilagyi DE	3	First author—3
Kakkar VV	3	First author—2, second author—1
Mullen JL	3	First author—2, second author—1
Fischer JE	3	First author—2, third author—1
Buzby GP	3	First author—1, second author—1, third author—1
Rosato EF	3	Never first author
Elliot JP	3	Never first author
Smith RF	3	Never first author
James JH	3	Never first author
Whipple AO	2	First author—2
Cruse PJ	2	First author—2
Morton D	2	First author—2
Stout AP	2	First author—2
Breslow A	2	First author—2
Huggins C	2	First author—2

not make it into our list. Interestingly, Steven A. Rosenberg, the second most cited physician in the world (22,734 citations from 1981 to 1998), made it to position 29 on our list. Only one Nobel Laureate appears in this list: Dr. Charles Huggins (nos. 26 and 100). That a few "bizarre" inclusions—such as lung lymph fistulas in sheep (no. 8) or hemangiopericytomas (no. 12)—are included suggests that the citation index is prone to sporadic aberrations.

A few observations are not surprising: That most top-cited publications originated from the United States is explained by the

size of the American surgical community and its wealth and scientific output, which dominates the world of surgical publishing. It is also known that American authors tend to be biased in their citation practice toward local articles [5] and that U.S. reviewers have a significant preference for U.S. papers [6]. Notably, only four articles originated from non-English-speaking countries (France, Sweden, Uganda), with most stemming from the United States and the United Kingdom. Authors from these two countries tend to cite material produced in their own countries [5]. Clearly, the above factors may amplify the citation and impact of papers produced in North America and the United Kingdom. As expected, top-cited papers were published in surgical journals high on the impact factor list—fitting into the well known paradigm in which leading journals attract the best-cited publications, which in turn maintain the high impact factor of these journals [7, 8].

This list of the top-cited papers in general surgery may be worthwhile on a few accounts. It identifies seminal contributions and their originators; it facilitates the understanding and discourse of modern surgical history; and it offers surgeons hints about what makes a contribution a “top-cited classic.” To produce such a “classic” the surgeon and his or her group must come up with a clinical or nonclinical innovation, observation, or discovery that has a long-standing effect on the way we practice, be it operatively or nonoperatively. Based on our findings, to be well cited such a contribution should be published in the English language in a high-impact journal. It is more likely to resonate loudly if it originates from a North American or a British “ivory tower.” Moreover, it needs luck.

Résumé. Suivant le nombre de fois qu'un article est cité dans les journaux scientifiques on peut mesurer son impacte sur un domaine biomédical spécifique ou sur une spécialité, mais aussi l'impacte de la créativité de l'auteur. Notre objectif a été d'identifier et d'analyser les caractéristiques des 100 articles les plus fréquemment cités dans les journaux dédiés à la chirurgie générale et ses sous-spécialités proches. En se servant de la banque de données de la *Science Citation Index* (1945–1995) de l'Institut d'Information Scientifique, on a identifié 1500 articles, qui ont été cités au moins 100 fois et on a sélectionné les 100 meilleurs (les plus cités) pour une analyse plus fine. Les cent articles ont été publiés entre 1931 et 1990, plus des deux tiers étant publiés après 1960. Le nombre moyen de citations par article a été de 405 (extrêmes 278–1013). Quatre-vingt-quatre articles sont d'origine nord-américaine (Etats Unis = 78, Canada = 6) et de la Royaume Unie ($n = 12$). L'état des Etats-Unis fournissant le plus grand nombre a été l'état de New York ($n = 14$); les Universités de Harvard et de Columbia ont été en tête des institutions avec 6 articles chacune. Les 100 articles ont été publiés dans 10 journaux différents avec en premier, les *Annals of Surgery* ($n = 40$), suivi de *Surgery* ($n = 15$), *Archives of Surgery* ($n = 12$), *Surgery, Gynecology and Obstetrics* ($n = 11$), et le *British Journal of Surgery* ($n = 10$). Quatre-vingts de ces articles ont eu trait à la clinique, six étaient des articles de revue général, et 14 des sciences fondamentales. Dix-huit articles ont rapporté une nouvelle technique chirurgicale et six faisaient référence à une prothèse. Parmi les disciplines chirurgicales représentées, la chirurgie gastrointestinale, le trauma et les soins intensifs ont été en tête de liste, chacun avec 25 articles, suivis de la chirurgie vasculaire ($n = 15$). Trente-quatre personnes ont été les auteurs de deux articles ou plus parmi les articles les plus cités. Notre liste d'articles les plus cités a pu identifier les contributions originelles et leurs auteurs, facilitant la compréhension et le cours de l'histoire moderne de la chirurgie et elle offre aux chirurgiens des indices de ce doit comporter une contribution de cette ampleur. Pour produire une telle “classique,” l'écrivain chirurgien et son équipe doivent «trouver» une innovation, clinique ou autre, une observation ou une

découverte qui ont un effet au long cours sur la façon dont on exerce notre métier— que ce soit opératoire ou pas. Pour être bien cité la contribution doit être écrite en Anglais dans un journal à grand impacte. L'article a d'autant plus de chances de «marquer» qu'il a comme origine les Etats Unis ou une tour d'ivoire britannique.

Resumen. El número de veces que un artículo es citado en las revistas científicas refleja su impacto sobre un campo biomédico específico o una especialidad, así como el de la creatividad del autor. El propósito de nuestro trabajo fue identificar y analizar las características de los 100 artículos más frecuentemente citados y publicados en revistas dedicadas a la cirugía general y a sus especialidades más cercanas. Utilizando la base de datos (1945–1995) del *Science Citation Index* del Institute for Scientific Information, se identificaron los 1500 artículos citados 100 y más veces, y se procedió a analizar los 100 artículos más citados. Estos 100 artículos fueron publicados entre 1931 y 1990, y de ellos 2/3 lo fueron después de 1960. El número promedio de citas por artículo fue 405, con un rango de 278–1013. Ochenta y cuatro son originarios de Norte América (EUA = 78, Canadá = 6) y el Reino Unido ($n = 12$). Los mayores números lo tuvieron Nueva York, entre los estados ($n = 14$), y las universidades de Harvard y Columbia entre las instituciones, con 6 artículos cada una. Los 100 artículos fueron publicados en 10 revistas quirúrgicas diferentes, con el mayor número en *Annals of Surgery* ($n = 40$), seguido por *Surgery* ($n = 15$), *Archives of Surgery* ($n = 12$), *Surgery, Gynecology and Obstetrics* ($n = 11$), y *British Journal of Surgery* ($n = 10$). Ochenta de los artículos se refieren a experiencias clínicas, 6 son artículos de revisión y 14 se refieren a ciencia básica. Dieciocho artículos reportaban una nueva técnica quirúrgica y 6 un aditamento protésico. La cirugía gastrointestinal y el trauma y el cuidado crítico fueron los principales temas en el campo quirúrgico, con 25 artículos cada uno, seguidos por cirugía vascular ($n = 15$). Treinta y cuatro personas fueron los autores de dos o más de los artículos mayormente citados. La lista de los artículos mayormente citados identifica contribuciones seminales y a quienes las originaron, facilitando con ello la comprensión y el discurso de la historia quirúrgica moderna e indicando a los cirujanos qué hace de un artículo un “clásico de máxima citación.” Para lograr un “clásico,” el cirujano y su grupo deben producir una innovación, observación o descubrimiento de carácter clínico o no clínico que ejerza un efecto a largo plazo sobre la manera como se practica la cirugía—sea o no referente a la parte operatoria. Para que llegue a ser ampliamente citada, una contribución debe ser publicada en el idioma inglés y en una revista de alto impacto. Y tendrá mayor probabilidad de repercusión si se origina en una torre de marfil norteamericana o británica.

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