

## *h*-Index of high-impact hospitals

Many of the finest hospitals not only provide health services, but also perform medical research. The quality of service in hospitals has been evaluated in a few studies<sup>1,2</sup>. Research impact is also an achievement of a good hospital and can be measured by citation indices<sup>3</sup>. In

2005, a popular citation index, the *h*-index, was developed by Hirsch for measuring the academic impact of scientists<sup>4</sup>. The application of this index has been extended to journals<sup>5</sup>, countries<sup>6</sup>, science funds<sup>7</sup> and institutions<sup>8</sup>. The *h*-index of a hospital focuses on high-impact research

papers published by its doctors or researchers and provides an interesting evaluation perspective on the research impact of top hospitals.

Although there are numerous multi-disciplinary databases providing information on publications and citations for

**Table 1.** Top 50 high-impact hospitals in the world (based on ESI data from 1 January 2000–31 August 2010)

No.	Hospital	Country	Papers	Citations	<i>h</i> -Index
1	Massachusetts Gen Hosp	USA	19,203	600,242	257
2	Brigham & Womens Hosp	USA	16,340	564,384	256
3	Mayo Clin & Mayo Fdn	USA	29,425	640,126	222
4	Cleveland Clin Fdn	USA	15,872	345,281	181
5	St Jude Childrens Hosp	USA	4,771	135,635	109
6	Karolinska Univ Hosp	Sweden	9,573	164,656	103
7	Mt Sinai Hosp	Canada	4,441	124,140	99
8	Hosp Sick Children	Canada	7,428	135,900	84
9	Sahlgrens Univ Hosp	Sweden	5,175	95,994	84
10	Univ Hosp Gasthuisberg	Belgium	2,372	58,484	77
11	Hammersmith Hosp	England	2,978	89,729	72
12	Childrens Hosp Philadelphia	USA	5,887	106,319	68
13	Addenbrookes Hosp	England	3,737	81,352	68
14	New York State Psychiat Inst & Hosp	USA	2,542	63,144	68
15	Royal Marsden Hosp	England	2,537	64,236	67
16	Hosp Clin Barcelona	Spain	3,721	63,895	66
17	Princess Margaret Hosp	Canada	2,496	59,657	65
18	Guys & St Thomas Hosp Trust	England	4,129	73,941	61
19	St Vincents Hosp	Australia	4,074	79,074	60
20	Royal Brompton Hosp	England	2,477	54,114	60
21	Univ Hosp Cleveland	USA	2,340	75,177	59
22	Henry Ford Hosp	USA	3,745	77,794	58
23	Rigshosp	Denmark	3,273	66,542	55
24	Ullevål Hosp	Norway	2,401	48,800	55
25	Royal Melbourne Hosp	Australia	2,814	61,812	54
26	Western Gen Hosp	Scotland	2,143	57,700	52
27	Radcliffe Infirm	England	1,085	49,683	50
28	St Marys Hosp	England	3,692	65,063	49
29	St Bartholomews Hosp	England	2,446	62,958	49
30	Univ London St Georges Hosp	England	2,405	57,802	47
31	St Michaels Hosp	Canada	2,689	45,370	45
32	St Josephs Hosp	USA	2,289	40,297	44
33	St Thomas Hosp	England	3,802	67,892	43
34	Norwegian Radium Hosp	Norway	1,603	51,086	42
35	William Beaumont Hosp	USA	1,824	43,037	42
36	Toronto Gen Hosp	Canada	1,768	38,200	42
37	St George Hosp	England	3,268	67,578	40
38	Rhode Isl Hosp	USA	1,923	38,534	40
39	Christie Hosp	England	1,633	45,008	39
40	Hosp Gen Valle Hebron	Spain	2,122	41,080	39
41	Prince Wales Hosp	Australia	3,003	47,138	38
42	Haukeland Univ Hosp	Norway	2,689	46,972	37
43	Queen Elizabeth Hosp	China-Hong Kong	2,900	45,867	37
44	Southampton Gen Hosp	England	1,974	40,802	37
45	Vancouver Gen Hosp	Canada	1,820	38,236	36
46	Hadassah Univ Hosp	Israel	3,337	52,578	32
47	Chang Gung Mem Hosp	China-Taiwan	5,093	48,091	31
48	Royal Prince Alfred Hosp	Australia	2,628	40,611	31
49	Great Ormond St Hosp Children	England	3,118	45,915	27
50	Taipei Vet Gen Hosp	China-Taiwan	4,108	41,062	21

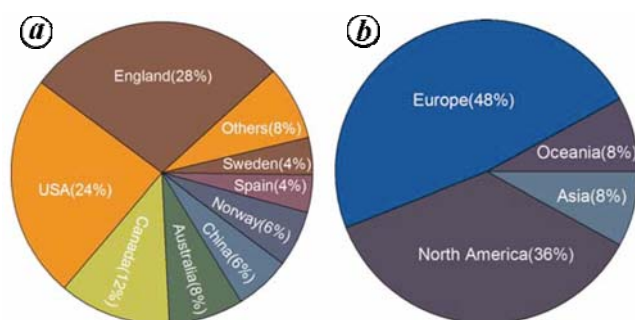


Figure 1. Regional distribution of the top 50 high-impact hospitals.

computing the *h*-index, the ones that are commonly used include *Web of Science*, Essential Science Indicators (ESI), Scopus and Google Scholar. ESI (<http://esi.isiknowledge.com>) is more suitable for determining the *h*-indices of hospitals as it provides standardized institution name tagging and avoids inconsistent author addresses.

ESI lists publications and citations for ranking scientists, institutions, countries and journals based on the articles indexed in the *Science Citation Index (SCI)* and *Social Sciences Citation Index (SSCI)*. It covers 22 specific research fields and sums up data covering 10–11 years. Here, we have used data from a 10-year plus 8-months period, namely 1 January 2000–31 August 2010. The procedure adopted for data collection and calculations is as follows: (i) obtain the list of all institutions with their total number of papers and citations from the ‘citation rankings’ in ESI. (ii) Determine the high-impact hospitals using the search keywords ‘hosp’, ‘infi’ and ‘clin’, and delete the wrong cases as far as possible. For example, in ESI, we removed a case named ‘UNIV HOSP’ because it includes many hospitals in different universities. (iii) Calculate the *h*-index of each hospi-

tal using ‘view papers’ under the ESI data of that hospital. Based on their *h*-indices, the top 50 high-impact hospitals in the world are listed in Table 1.

As seen from Table 1, Mayo Clin & Mayo Fdn has the most number of papers (29,425) and citations (640,126), but its *h*-index (222) is smaller than that of Massachusetts Gen Hosp (257) and Brigham & Womens Hosp (256). It is remarkable that the *h*-indices of the latter two hospitals are close to those of some renowned universities such as Duke University (257) and University of Cambridge (255). Of course, one important reason is that the average citations for medical disciplines may be higher.

A large difference is seen between the higher and lower cases (Table 1). The top hospitals have obvious advantages in terms of quantity of output, number of citations as well as total research impact. This is often associated with scale; many of these hospitals are large general hospitals. There are also some university hospitals that have high impact. For example, the Karolinska Univ Hosp, which is closely affiliated with the Karolinska Institute in Sweden, gets an *h*-index that is highest among the seven university hospitals and higher than other hospitals

in Table 1, except the five top hospitals in USA.

The leading hospitals in USA have a great advantage in terms of *h*-index. But, as shown in Figure 1a, it is interesting that hospitals in England feature more (28%) in the set of 50 high *h*-index hospitals than those in USA (24%). In addition, Figure 1b shows that hospitals in Europe constitute nearly 50% and none of them are located in Africa and Latin America. The regional distribution of high-impact hospitals seems to be imbalanced.

Although the *h*-index is only one measure and cannot cover all the achievements of a hospital, it can provide a remarkable assessment of the research impact of a hospital.

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## The *Bt* brinjal–biodiversity issue

In a recent note discussing the effect of *Bt* brinjal on biodiversity, Bokalia<sup>1</sup> calls for a healthy debate based on unbiased scientific data. This is surely no more than we would reasonably expect. An intrinsic part of this debate is the *Bt* brinjal–biodiversity issue, commented upon recently by several authors<sup>2–5</sup>. In the con-

text of the heightened need to maintain balance in the natural environment, the biodiversity issue is a legitimate one and deserves careful consideration.

On-going biodiversity concerns include the effects of *Bt* toxins on non-target invertebrates<sup>6</sup> as well as transgene transfer to brinjal wild relatives<sup>7</sup>. However,

contrary to the view<sup>1</sup> that these points are not convincing, they have nevertheless featured strongly in several authoritative reports<sup>8,9</sup> on the safety of *Bt* brinjal. Furthermore, the statement by the Minister for Environment and Forests, Government of India in February 2010, clearly refers to these precise biodiversity