

## **Determinants of downloads and citations for articles published in Intensive Care Medicine**

J.F. Timsit<sup>1</sup>, G. Citerio<sup>2</sup>, M Lavilloniere<sup>1</sup>, A. Perner<sup>3</sup>, S. Ruckly<sup>1</sup>, J. Bakker<sup>4</sup>, M. Bassetti<sup>5</sup>, D. Benoit<sup>6</sup>, J.R. Curtis<sup>7</sup>, G.S. Doig<sup>8</sup>, M. Herridge<sup>9</sup>, S. Jaber<sup>10</sup>, L. Papazian<sup>11</sup>, M.J. Peters<sup>12</sup>, P. Singer<sup>13</sup>, M. Smith<sup>14</sup>, M. Soares<sup>15</sup>, A. Torres<sup>16</sup>, A. Vieillard-Baron<sup>17</sup>, E. Azoulay<sup>18</sup>

- 1- Inserm U 1137/Univ Paris Diderot, Sorbonne Paris Cite, Paris, France
- 2- Università degli Studi di Milano Bicocca, Monza, Italy
- 3- University of Copenhagen, Copenhagen, Denmark
- 4- Erasmus MC University Medical Center, Rotterdam, Netherlands
- 5- Azienda Ospedaliera Universitaria Santa Maria della Misericordia, Udine, Italy
- 6- Ghent University Hospital, Ghent, Belgium
- 7- The University of Washington, Seattle, United States
- 8- University of Sydney, Sydney, Australia
- 9- University of Toronto, Toronto, Canada
- 10- Saint Eloi University Hospital, Montpellier, France
- 11- Aix-Marseille Université, Marseille, France
- 12- UCL Institute of Child Health and Great Ormond St Hospital, London, United Kingdom
- 13- Tel Aviv University, Tel Aviv, Israel
- 14- University College London Hospitals, London, United Kingdom
- 15- D'Or Institute for Research and Education, Rio de Janeiro, Brazil
- 16- Hospital Clinic of Barcelona, Barcelona, Spain
- 17- Hospital Ambroise Paré, Paris, France
- 18- Paris Diderot Sorbonne University, Paris, France

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## **INTRODUCTION:**

Three themes are key in a journal's mission and vision statement: showcasing the best science, educating the targeted readership, and framing the contemporary and key issues of our time (1). Citations and downloads are considered to represent the first and the second theme. A careful understanding of the determinants of citations and downloads are therefore important to advancing in all of the metrics that support the growing success for our journal. This study is part of a global quality improvement process for articles published in Intensive Care Medicine (2-4).

## **METHODS:**

All papers accepted in 2012 and 2013 have been tracked through the Web-of-Science database for referencing and the Springer link statistics report for downloads from 01/01/2013 to 12/31/2014. Non-parametric correlation coefficients were used to assess the relationship between citations and downloads. Relative risk of being downloaded or cited one time have been modeled through the use of a negative binomial regression. The models were systematically adjusted on the time of exposure of the manuscript (longer for article published at the beginning of the year).

Variables introduced in the model were submitting country, manuscript category, open access, keywords, topics, number of authors, as well as h-index of first and last author.

Statistics were done using SAS 9.4 software. A p value of .05 or less was considered significant.

## **RESULTS:**

Among the 404 articles, 304 (61%) were original (including 59 pediatric papers), 46 (11.5%) were review articles (including 10 Conference Reports and Expert Panel papers), and 32 (8%) were experimental studies. Major topics were sepsis (21%), ventilation (20%) and hemodynamic (16%). Only 6% of the papers were in open access. The median (IQR) number of authors per article was 7 (5-9), with h-index of first and last authors of 9 (4-16) and 23 (15-37), respectively. The median (IQR) total number of 2013-2014 downloads was 696 [467-1083] and the median (IQR) total number of 2013-2014 cites was 6 (4-11) per article. The correlation between citations and downloads was significant, but relatively weak indicating that only 28% of the variability of downloads was explained by the variability of cites ( $R^2=0.28$ ,  $p<0.0001$ ). Downloads and citations were significantly related to the time of exposure ( $p<0.0001$ ).

Downloads were independently explained by manuscript type with a major impact of conference report and expert panel, reviews and also What's new series. Other independent factors were the h-index of the last author, the use of "septic shock" in the key word list. Finally, open access papers were significantly more likely to be downloaded (Table).

Independent predictors of cites included four variables; manuscript type (Conference Reports and Expert Panel, review articles, and original manuscripts); number of authors and h-index of the first author. Last, open access papers were significantly more likely to be cited (Table).

## **DISCUSSION:**

This study provides important elements to improve our understanding of what makes a paper read or cited. Optimizing use and identification of manuscript's keywords appears as a simple and major way to improve access to ICM articles. The number of authors directly linked to the multinational nature of the authorship should also be promoted. Although not an open access journal, this study suggests for authors the independent impact of having their accepted manuscripts as an open access paper.

Interestingly, the article type are associated differently with downloads and cites. What's new series provides rapid up-to-date information immediately accessible for a large panel of our reader and independently explained downloads, whereas original articles were key determinants of cites.

The analysis of the altmetrics, considered to frame the contemporary and key issues of our time, remained to be evaluated. Given the important rise in cites and download in the past 6 years, a repeated analysis of the determinants of cites and downloads in 2018 will also be helpful (5, 6).

Variables	Items	Relative risks (95% CI)	p value
<b>Determinants of cites</b>			
Type of article	What's New in Intensive Care	Ref.	<b>&lt;.0001</b>
	Conference Reports and Expert Panel	4.6 (2.52 ; 8.41)	<.0001
	Experimental	1.07 (0.68 ; 1.69)	0.77
	Original	1.8 (1.23 ; 2.63)	0.0025
	Pediatric Original	1.1 (0.72 ; 1.67)	0.66
	Review	3.55 (2.39 ; 5.28)	<.0001
Nb_of authors	< 5	Ref.	<b>0.0003</b>
	5 - 6	1.03 (0.84 ; 1.28)	0.76
	7 - 9	1.24 (1.01 ; 1.52)	0.042
	> 9	1.5 (1.21 ; 1.87)	0.0003
h-index of the first author	< 4	Ref.	<b>0.01</b>
	4 - 9	1.21 (1.01 ; 1.45)	0.037
	10 - 16	1.35 (1.1 ; 1.65)	0.0036
	> 16	1.36 (1.12 ; 1.66)	0.0023

Open access article	Yes	1.31 (1.01 ; 1.7)	<b>0.044</b>
<b>Determinants of downloads</b>			
Key word	Septic shock	1.57 (1.22 ; 2.02)	0.0005
Type of article	Experimental	<b>Ref.</b>	<b>&lt;.0001</b>
	Conference Reports and Expert Panel	20.41 (13.79 ; 30.2)	<.0001
	Original	1.97 (1.61 ; 2.41)	<.0001
	Pediatric Original	1.24 (0.99 ; 1.55)	0.062
	Review	4.28 (3.31 ; 5.52)	<.0001
	What's New in Intensive Care	3.18 (2.35 ; 4.31)	<.0001
Open-access article	Yes	1.49 (1.18 ; 1.87)	0.0007
h-index of the last author	< 15	<b>Ref.</b>	<b>0.021</b>
	15 - 23	0.99 (0.85 ; 1.14)	0.85
	24 - 37	0.99 (0.85 ; 1.15)	0.93
	> 37	1.2 (1.04 ; 1.4)	0.016

TABLE: Determinants of cites and downloads (multivariate analyses)

P value in bold indicates the overall statistical significance within one variable with more than 2 items.

NB1: The relative risk of the binomial regression indicates the relative risk of being cited (downloaded) one fold more.

NB2: 5 international conferences consensus were excluded from the analysis " Consensus statement of the ESICM task force on colloid volume therapy in critically ill patients" ; " International evidence-based recommendations for point-of-care lung ultrasound" ; " The Berlin definition of ARDS: an expanded

rationale, justification, and supplementary material" ; " Contemporary extracorporeal membrane oxygenation for adult respiratory failure: life support in the new era" ; " Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock, 2012“

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