

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

ScienceDirect

journal homepage: [www.elsevier.com/locate/burns](http://www.elsevier.com/locate/burns)

## Re-evaluation of websites from burn centers in Austria, Germany and Switzerland

Stefan Benedikt<sup>a,\*</sup>, Alexandru-Cristian Tuca<sup>a</sup>, Alen Palackic<sup>a</sup>,  
Paul Wurzer<sup>a,d</sup>, Daniel Popp<sup>a,b</sup>, Christian Tapking<sup>b,c</sup>,  
Lars-Peter Kamolz<sup>a,d</sup>

<sup>a</sup> Division of Plastic, Aesthetic and Reconstructive Surgery, Department of Surgery, Medical University Graz, Graz, Austria

<sup>b</sup> Department of Surgery, University of Texas Medical Branch and Shriners Hospitals for Children, Galveston, TX, USA

<sup>c</sup> Department of Hand, Plastic and Reconstructive Surgery, Burn Trauma Center, BG Trauma Center Ludwigshafen, University of Heidelberg, Ludwigshafen, Germany

<sup>d</sup> COREMED — Cooperative Centre for Regenerative Medicine, Joanneum Research GmbH, Graz, Austria

### ARTICLE INFO

#### Article history:

Accepted 7 August 2018

Available online xxx

#### Keywords:

Unit

Internet presence

Quality

Homepage

Webpage

World Wide Web

### ABSTRACT

**Introduction:** Websites serve as information and communication platforms; hence, they are important tools for the self-promotion of hospitals. In 2010, Selig et al. evaluated the online presence of burn centers in Germany, Austria, and Switzerland based on 37 quality criteria. This study aimed to re-evaluate these websites to assess their development over the past 6.5 years.

**Materials and methods:** Websites of the German-speaking burn centers were re-evaluated according to criteria previously described by Selig et al. Particular attention was paid to specific information on burns. Additionally, the implementation of social media platforms was investigated.

**Results:** There was an overall increase in the quality of information published on websites. There was a considerable improvement recorded, especially in the categories of “teaching” and “patient care.” However, burn-specific information was found to be still sparse. Over 50% of the hospitals were present on social media.

**Conclusions:** Although the quality of information published on German-speaking burn center websites increased, they must be further developed, especially regarding burn-related information. Moreover, a clear structure and design could prevent long searches and facilitate an easier flow of information. The interface from websites and social media platforms appear to be an important tool for up-to-date self-promotion.

© 2018 Elsevier Ltd and ISBI. All rights reserved.

\* Corresponding author at: Division of Plastic and Reconstructive Surgery, University Hospital Graz, Auenbruggerplatz 29, 8036 Graz, Austria.

E-mail addresses: [stbenedikt@gmx.at](mailto:stbenedikt@gmx.at) (S. Benedikt), [alexandru.tuca@medunigraz.at](mailto:alexandru.tuca@medunigraz.at) (A.-C. Tuca), [alen.palackic@gmx.at](mailto:alen.palackic@gmx.at) (A. Palackic), [paul.wurzer@medunigraz.at](mailto:paul.wurzer@medunigraz.at) (P. Wurzer), [danpopp@UTMB.EDU](mailto:danpopp@UTMB.EDU) (D. Popp), [ctapkin@utmb.edu](mailto:ctapkin@utmb.edu) (C. Tapking), [lars.kamolz@medunigraz.at](mailto:lars.kamolz@medunigraz.at) (L.-P. Kamolz).

<https://doi.org/10.1016/j.burns.2018.08.013>

0305-4179/© 2018 Elsevier Ltd and ISBI. All rights reserved.

## 1. Introduction

Since the introduction of the World Wide Web in the second half of the 20th century, websites, including those of healthcare providers, the information they provide, and their associated services, expanded rapidly. Hence, websites have become an indispensable medium for health-related information and an important tool for healthcare providers.

In developed countries, more than 80% of people are using the internet on a daily basis, and over 80% of households have internet access (estimated status 2015) [1].

In the healthcare sector, hospitals have created individual websites using them as a medium to provide information, communication, and for providing specialized services. Among the vast amount of medical websites appearing over the last decade [2], considerable fluctuations regarding quality were noted, especially concerning the dissemination of incomplete and misleading information [3-5]. Given the fact that nearly 60% of the European internet users search health-related information via the World Wide Web [6], it is important that professional healthcare homepages provide reliable and complete information for patients and relatives, students, researchers and clinicians. Well-designed high-quality websites may serve hospitals to improve their quality of medical care, teaching and research and moreover increase hospital services for the public.

Over the last decade, various models and criteria have been introduced to assess the quality of such medical websites [7]. In 2010 Selig et al. [8] evaluated the online-presence of burn units in Germany, Austria, and Switzerland; they created a specific assessment model to validate the quality of health-related information.

Since initial evaluation the internet has grown rapidly, the percentage of households and people worldwide using the internet increased by around a third [1]. Social media such as Facebook, Youtube and Twitter became powerful communication tools, not only for individuals but also for business companies. The current study aimed to create a follow-up reevaluation of websites from German-speaking burn centers to assess if the quality of the websites has changed over the past 6.5 years.

## 2. Methods

According to the previous study of Selig et al. [8], we performed a descriptive, quantitative, multicenter observational cross-sectional study. A list of burn centers and their uniform resource locators (URLs) were taken from the homepages of the German Burn Association and the Bundesverband für Brandverletzte e.V.<sup>1</sup> [9,10].

Within a six-week period, from February to March of 2017, websites of the burn centers were evaluated by the first author according to the topics of Selig et al. [8] listed in

<sup>1</sup> The 'Bundesverband für Brandverletzte e.V.' is a German non-profit organization providing advice and support for burn victims and their relatives.

Tables 1-6: "General Information," "Information Brokerage," "Research," "Teaching," "Patient Care," and "Key Aspects of Clinical Treatment." These topics consisted of 36 criteria of which 31 were declared as binary variables, whereas the other five were declared as ordinal variables, allowing values from zero to two. The latter criteria have the attached designation of "(0-2)" at the end of their description in Tables 1 and 2. If a criterion was met, one to two points (depending on criteria) were allocated to the burn unit. In total, each burn unit could reach up to 41 points. As several criteria were not clearly defined, we partly specified them in a separate column to ensure clear, meaningful, and standardized results. Similar to Selig et al., we searched for the availability of quality records of the selected hospitals and their burn units. Additionally, the implementation of social media platforms such as Facebook, YouTube, and Twitter was investigated.

For each burn unit, a limit of one and a quarter hours for data collection was defined. This limit was based on the argument that one important quality feature of websites is information, readily accessible to lay people. Analysis always followed the same pattern: the general section (contact, map, information for patients and relatives, history, etc.), as well as sections of the departments that were mainly responsible for the burn unit, were searched for the criteria mentioned above. If available, outstanding information was supplemented using the search aid provided on the website (the first 50 hits were analyzed). Hyperlinks to external websites were not pursued further, except if the medical departments were not represented on the website, but had their own homepage. Published press releases, as well as newspapers, were not evaluated as that sort of information may be accessible only for a short period and should not be used as a source for basic information. Also, archives and quality records older than one year were excluded because their content may not be up-to-date.

Documentation, descriptive statistical analysis, and graphical representation were done in Microsoft<sup>®</sup> Excel 2016 (Microsoft Cooperation, Redmond, United States). For each hospital website, one datasheet was created containing all information collected during the web search. If adult and pediatric patients were treated in one hospital but on separate burn units, they were summarized to one dataset according to the methods in the original study (2 cases). Data were listed in a spreadsheet, and the scores of every criterion were compared to the result of the previous study [8]. The total scores of every website were summarized in a bar chart.

## 3. Results

Forty-eight burn units were found according to the German Burn Association and the Bundesverband für Brandverletzte e.V. [9,10]. Five were excluded; one website from Switzerland which is a trilingual country was only available in French and therefore not regarded as a German speaking burn unit. One unit was closed a few years ago and three websites could not be found through an extensive internet search. The web search revealed one additional burn unit which had not been represented on the lists.



**Table 2 – Information brokerage.**

Description	Specifications	Benedikt et al.	Selig et al.	Difference
Integration of multimedia-based elements with regard to burn injuries (0-2)	1 point: at least a picture concerning the burn unit and/or burn injuries and/or their treatment (portraits of staff members were excluded) 2 points: videos, audio files, 3D panoramas, apps . . . concerning burns	66,7%	n.s.	
Integration of multimedia-based elements for patients in general (0-2)	1 point: at least a picture concerning the general information listed in <a href="#">Table 1</a> 2 points: videos, audio files, 3D panoramas, apps . . . concerning general information listed in <a href="#">Table 1</a>	100,0%	100,0%	+0,0%
Hyperlinks		100,0%	100,0%	+0,0%
Means of communication (e.g., email, telephone, chat)		100,0%	100,0%	+0,0%
Search aid		100% <sup>a</sup>	93,2%	+6,8%
Possibility to define the text size of the website		33,3%	34,1%	-0,8%

n.s.: not stated.  
<sup>a</sup> In four cases the provided search aid (9,5%) did not work.

**Table 3 – Research.**

Description	Specifications	Benedikt et al.	Selig et al.	Difference
Key scientific aspects in Burn Surgery	Of the department which is mainly responsible for the burn unit	31,0%	50,0%	-19,1%
Publication or scientific projects in Burn Surgery	Of the department which is mainly responsible for the burn unit	50,0%	45,5%	+4,5%

**Table 4 – Teaching (this category was kept general, as it was not related to burns in the original study).**

Description	Specifications	Benedikt et al.	Selig et al.	Difference
Information on current courses	On any topic for medical doctors <i>At least a section on the website to inform about current courses (but with no courses within the next 365 days)</i>	90,5% 95,2%	47,7%	+42,8%
Introduction on lecturers	Six coincidental courses/lectures were examined whereof 50% or more had to include an introduction of at least one lecturer	83,3%	n.s.	
Information on clinical clerkships or rotations for students	For medical students or medical doctors; provided in the general information of the homepage or in the information of the department which is mainly responsible for the burn unit (the social year was excluded)	85,7%	75,0%	+10,7%
Information on meetings (e.g., congress, course)	<i>At least a section on the website to inform about current meetings (but with no meetings within the next 365 days)</i>	73,8% 88,1%	n.s.	

n.s.: not stated; text in italic: additional evaluation that was not performed in the original study.

**Table 5 – Patient care.**

Description	Specifications	Benedikt et al.	Selig et al.	Difference
Site plan “How to reach the hospital”		97,6%	97,7%	–0,1%
Site plan “How to reach the burn unit”	If there was more than one department/ward in the building, an approximate layout plan was required	69,1%	65,9%	+3,2%
Information on the preparation for medical examination	Allergy passport, medicine list, x-ray images . . .	95,2%	11,4%	+83,8%
Information on possible waiting times	Information on possible occurring waiting times in the outpatient clinic or during inpatient admission; at least an explanation of the Manchester Triage System with approximate waiting times	7,1%	0,0%	+7,1%
	<i>Information on possible occurring waiting times in the outpatient clinic or during inpatient admission (while no time specification was given)</i>	66,7%		
Information on first aid measurements for burn injuries	Basic information	35,7%	18,2%	+17,5%
Background information on burn wound depth	Degrees	21,4%	18,2%	+3,2%
Background information on burn severity	Indications for a transfer to a burn unit or information on burn percentage or on the degrees of severity (after the recommendations of the “German Burn Association”)	26,2%	18,2%	+8,0%
Information for patients and relatives (e.g., staff members, social, counselling, spiritual guidance)		100,0%	100,0%	+0,0%
Total number of burn patients annually treated	Quality records were excluded, as they all were outdated and only contained the statistics of one single year.	35,7%	n.s.	
Emergency number(s)		100,0%	75,0%	+25,0%
	A number (or a link to the number) accessible on the first page of the website	88,1%	63,3%	+24,8%

n.s.: not stated; text in italic: additional evaluation that was not performed in the original study.

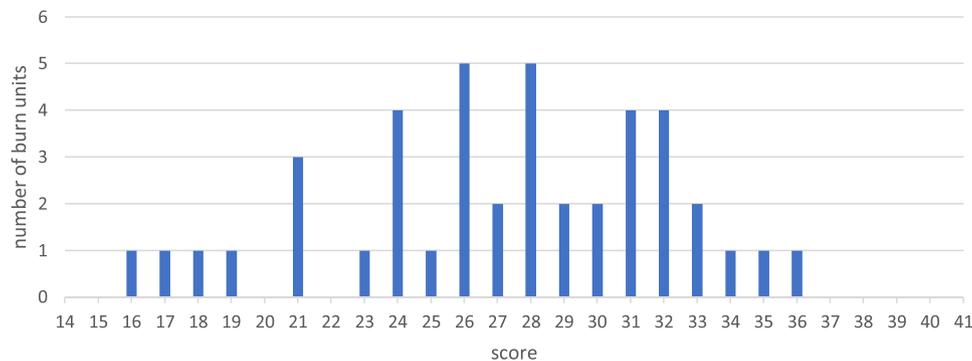
**Table 6 – Key aspects of clinical treatment.**

Description	Specifications	Benedikt et al.	Selig et al.	Difference
Information on primary care, skin grafting, post-operative treatment or scar revision procedures	One point if three or more examples were stated or if one treatment option was explained.	52,4%	81,8%	–29,4%
	<i>Treatment options explained very precisely</i>	24,4%		
Information on technical and diagnostic equipment	One point if following was stated: (1) At least two examples for equipment for burn treatment according to the guidelines of the German Burn Association excluding the number of beds (it has to be clearly recognizable for the average person that the stated equipment is used for burn injuries). (2) One piece of equipment recommended by the German Burn Association was explained precisely.	26,2%	77,3%	–51,1%
Total available number of ICU beds for burn victims		73,8%	59,1%	+14,7%

Text in italic: additional evaluation that was not performed in the original study.

In total, 44 burn units of 42 hospitals had 41 different websites. These websites were further investigated and evaluated. The total score of the single websites ranged from 16 to 36 out of a possible 41 points with a median of 28 (Fig. 1). Nine of the analyzed

criteria were available on each evaluated website including “Introduction of staff members,” “Introduction of the ward,” “General information of the hospital,” “Integration of multimedia-based elements for patients in general,” “Hyperlinks,”



**Fig. 1 – Distribution of the scores reached by the hospitals (maximum score: 41).**

“Means of communications,” “Search aid,” “Information for patients and relatives,” and “Emergency numbers.”

The topics of “Teaching” and “Patient care” improved, whereas burn-related information remains sparsely available. Information concerning treatment options and equipment of the hospital declined. Tables 1–6 show the results of all criteria compared to the results of Selig et al. [8].

Quality records were available in 90.9% of all burn units (90.5% of all hospitals); 38.6% were from the year 2015, and no recent report from 2016 was found.

Regarding the implementation of social media, we found 22 hospitals (52.4%) referring to at least one of their social media pages via hyperlinks on their website.

#### 4. Discussion

This study presents a re-evaluation of the online-presence of German-speaking burn centers according to the criteria of Selig et al. [8] and shows that there is an increase in quality of the evaluated websites. The lowest website score increased from nine to 16, and the number of criteria available on each website increased from four to nine. In terms of “Research,” results still do not exceed 50%, and the score of “Key scientific aspects of Burn Surgery” is even worse. As argued by Selig et al. [8], this may result in our sample consisting of university hospitals, where research is a part of the daily routine, and of non-university hospitals which set other priorities. Considerable improvement was noted in the topics “Teaching” and “Patient care.”

Regarding “Key aspects of clinical treatment,” the percentage of burn units stating the number of ICU beds for burn victims increased, while information on treatment possibilities and burn unit equipment decreased. The discrepancies might be due to the specific definitions we set for these criteria that may have been stricter than the original ones.

Additionally, the number of hospitals providing quality records increased from 72.7% to 90.5%, although most records were not up to date. A closer comparison of both studies was not possible because scores of the single burn unit websites and 8 of 36 criteria were not stated in the original study.

Overall, our results confirm a positive development in the online presence of analyzed burn centers. Non-burn related information was mostly presented in a well-prepared manner allowing a good overview of the services provided by the

hospitals. However, the scores for language selection and information about possible delays of treatments were insufficient. We propose that there should be at least an English version of the website always available. Furthermore, approximate waiting times or at least a brief explanation of the Manchester Triage System (MTS) with corresponding maximum waiting times may make it easier for patients to schedule encounters in advance. Waiting time pagers allow patients to spend waiting times outside of outpatient clinics and would be a good option, especially for children [11].

Burn related information was found to be insufficient in certain criteria among most websites; background information illustrated with multimedia elements and a good overview of therapeutic options and hospital resources, in combination with current quality records indicating the department expertise, were mostly missing. However, a lack of background information concerning prevention, first aid, and treatment options has been reported in several studies, not only on burn center homepages but also on other websites containing burn-related topics [12–16]. Additionally, contact references to supporting groups for burn victims and detailed site plans marking the location of the burn unit should always be available on burn center websites. An example of a well-organized 3D sitemap is the homepage of “Klinikum Kassel” [17]. Furthermore, the inclusion of information and self-help programs [18] as well as customized smartphone applications, based on models of existing burn-related applications in application stores [19], may improve the reliability and usability of websites.

Improvement may also be needed in areas concerning accessibility and usability. Information yield was often complicated by unstructured web pages in conjunction with multiple hyperlinks causing loss of overview. Certain information was often only accessible via hyperlinks to external websites. On the one hand, this led to a considerable waste of time due to the need for reorientation on a new website; on the other hand, this information was not always accessible due to access limitations or changed URLs.

Strengths of this study include well-defined, standardized data collection methods and documentation of results (see Tables 1–6) making it easily reproducible and comparable to future studies using similar methods. Data collection was performed exclusively by one individual (first author) under the supervision of the co-authors. This lowered the risk of statistical bias. However, results may be observer dependent

which can be noted as a drawback. Moreover a second observer at best member of the previous study group of Selig et al. [8] would have been beneficial. The fact that the evaluation of usability and accessibility of the websites was a subordinate part of the study design could also be regarded as a limitation. Evaluation tools like LIDA [20] would have been helpful as they provide standardized models to evaluate the quality of websites. Tools like the Discern instrument to judge the quality of written information about treatment choices [21] or FLES to analyze the readability of text [22] may have facilitated and improved data evaluation. An aspect to be explored in future studies is focusing the topic of “teaching” exclusively on burn-related contents to acquire more conclusive data.

## 5. Conclusions

A well-prepared burn center website has become indispensable with the internet growing continuously as a source of readily accessible information. Overall, there was an increase in the quality of information provided, although burn-specific information is still sparse and warrants further improvements. The frequent implementation of links to social media suggests that these platforms are becoming an important tool for up-to-date self-promotion.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Conflict of interest

None reported.

## Author’s role/participation in the authorship

All authors made substantial contributions to the conception or design of the work or to the acquisition, analysis, or interpretation of data for the work and to the drafting of the work or revision of the work for intellectual content (all authors).

- Stefan Benedikt, MD: conception, study design, evaluation of the websites, documentation, analysis and interpretation of data, writing of the manuscript.
- Alexandru-Cristian Tuca, MD: conception, study design, supervision of the first author during website evaluation, revision of the manuscript.
- Alen Palackic: conception, analysis and interpretation of data and revision of the manuscript.
- Paul Wurzer, MD: study design, revision of the manuscript.
- Daniel Popp, MD: interpretation of data, writing and revision of the manuscript.
- Christian Tapking, MD: interpretation of data, writing and revision of the manuscript.

- Lars-Peter Kamolz, MD: conception, study design, supervision of the first author during website evaluation, revision of the manuscript.

## Acknowledgement

The authors express their thanks to Jacob E. Benavidez, BSc. (School of Medicine, University of Texas Medical Branch, Galveston, TX, USA) for providing language help and for proof reading the article.

## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.burns.2018.08.013>.

## REFERENCES

- [1] ITU — International Telecommunications Union. ICT — Facts & Figures. 2015 <https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf>. [Accessed 25 June 2017].
- [2] Internet Live Stats. Total Number of Websites. 2017 <http://www.internetlivestats.com/total-number-of-websites>. [Accessed 3 July 2017].
- [3] Haymes AT. The quality of rhinoplasty health information on the internet. *Ann Plast Surg* 2016;76:143-9, doi:<http://dx.doi.org/10.1097/SAP.0000000000000660>.
- [4] Biggs TC, Bird JH, Harries PG, Salib RJ. YouTube as a source of information on rhinosinusitis: the good, the bad and the ugly. *J Laryngol Otol* 2013;127:749-54, doi:<http://dx.doi.org/10.1017/S0022215113001473>.
- [5] Lynch NP, Lang B, Angelov S, McGarrigle SA, Boyle TJ, Al-Azawi D, et al. Breast reconstruction post mastectomy — let’s Google it. Accessibility, readability and quality of online information. *Breast* 2017;32:126-9, doi:<http://dx.doi.org/10.1016/j.breast.2017.01.019>.
- [6] Eurostat — Statistics Explained. Internet activities in the past three months by age group EU-28, 2016 (% of internet users). 2016 [http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Internet\\_activities\\_in\\_the\\_past\\_three\\_months\\_by\\_age\\_group\\_EU-28\\_2016\\_\(%25\\_of\\_internet\\_users\)4.png](http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Internet_activities_in_the_past_three_months_by_age_group_EU-28_2016_(%25_of_internet_users)4.png). [Accessed 27 June 2017].
- [7] Jeddi FR, Gilasi H, Khademi S. Evaluation models and criteria of the quality of hospital websites: a systematic review study. *Electron Physician* 2017;3786-93, doi:<http://dx.doi.org/10.19082/3786>.
- [8] Selig HF, Lumenta DB, Koenig C, Andel H, Kamolz LP. Evaluation of the online-presence (homepage) of burn units/burn centers in Germany, Austria and Switzerland. *Burns* 2012;38:444-9, doi:<http://dx.doi.org/10.1016/j.burns.2011.09.018>.
- [9] Brandverletzte-Leben. Verbrennungszentren/Kliniken. 2017 <http://www.brandverletzte-leben.de/brandverletzten-ratgeber/verbrennungszentren-kliniken/>. [Accessed 10 March 2017].
- [10] Deutsche Gesellschaft für Verbrennungsmedizin. Verbrennungszentren in Deutschland. <https://www.verbrennungsmedizin.de/zentren.php>. [Accessed 10 March 2017].

- [11] Sana Kliniken Duisburg. Pager — Angebot der Kinderklinikambulanz. <https://www.sana-duisburg.de/leistungsspektrum/fachabteilungen/kinder-und-jugendmedizin/medizinische-schwerpunkte/paediatriische-intensivmedizin.html>. [Accessed 6 July 2017].
- [12] Tiller G, Rea S, Silla R, Wood F. Burns first aid information on the Internet. *Burns* 2006;32:897-901, doi:<http://dx.doi.org/10.1016/j.burns.2006.02.020>.
- [13] Burgess JD, Cameron CM, Cuttle L, Tyack Z, Kimble RM. Inaccurate, inadequate and inconsistent: a content analysis of burn first aid information online. *Burns* 2016;42:1671-7, doi: <http://dx.doi.org/10.1016/j.burns.2016.09.017>.
- [14] Butler DP, Perry F, Shah Z, Leon-Villalpos J. The quality of video information on burn first aid available on YouTube. *Burns* 2013;39:856-9, doi:<http://dx.doi.org/10.1016/j.burns.2012.10.017>.
- [15] Oomman A, Sarwar U, Javed M, Hemington-Gorse S. YouTube as a potential online source of information in the prevention and management of paediatric burn injuries. *Burns* 2013;39:1652, doi:<http://dx.doi.org/10.1016/j.burns.2013.06.012>.
- [16] Bohacek L, Gomez M, Fish JS. An evaluation of internet sites for burn scar management. *J Burn Care Rehabil* 2003;24:246-51, doi:<http://dx.doi.org/10.1097/01.BCR.0000075844.04297.D9>.
- [17] Klinikum Kassel. Gebäudeübersicht. <http://app.guide3d.com/100028/kiosk/>. [Accessed 2 August 2017].
- [18] Sveen J, Andersson G, Buhrman B, Sjöberg F, Willebrand M. Internet-based information and support program for parents of children with burns: a randomized controlled trial. *Burns* 2017;43:583-91, doi:<http://dx.doi.org/10.1016/j.burns.2016.08.039>.
- [19] Wurzer P, Parvizi D, Lumenta DB, Giretzlehner M, Branski LK, Finnerty CC, et al. Smartphone applications in burns. *Burns* 2015;41:977-89, doi:<http://dx.doi.org/10.1016/j.burns.2014.11.010>.
- [20] Minervation — evidence based healthcare consultancy. LIDA; 2012 <http://www.minervation.com/category/lida/>. [Accessed 6 July 2017].
- [21] Discern — online. The Discern Handbook; 1998 <http://www.discern.org.uk/discern.pdf>. [Accessed 6 July 2017].
- [22] Flesh — Document Readability Calculator. <http://flesh.sourceforge.net/>. [Accessed 3 August 2017].