A human-centred design approach towards development of a digital clinical decision-support system for management of hospitalised patients with dengue

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Introduction

Dengue epidemics can rapidly increase demand in healthcare services across many endemic settings. However, there remains a lack of tools which can rapidly inform patient management and can be used at the point of care. Digital clinical decision-support systems (CDSS) allow for efficient organisation of care as well as improve the quality of patient management. It is important that these tools are designed for the end-user and with the healthcare setting in mind to increase adoption and usability.

Methods

We adopted a ground-up human-centred design approach to design a digital CDSS system for dengue management in Vietnam (D-CASS). A multidisciplinary team of data scientists, clinicians and social scientists were involved in a series of activities designed to map clinical processes, essential tasks and decision-making priorities which were crucial in the management of dengue at our hospital setting [1]. Frontend development was undertaken by a specialist UX designer with regular feedback from the research team and clinical end-users.

Results

Based on our previous work, the desired features for the CDSS identified were: i) patient organisation, ii) availability of guidelines and calculators with easy access, iii) display of results and iv) inference models for dengue diagnosis on admission [2] and further risk-stratification for hospitalised patients based on possible complications [3]. A web-based reactive framework suitable for display on computers and tablets was produced. Priority was placed on usability and modularity so that the system can be repurposed.

Conclusion

Dengue Clinical Application Tool (D-CAT) is a bespoke and rapidly scalable CDSS produced following clinical pathways, clinician's needs, and usability in mind. Further work will focus on prospective evaluation and iterative improvement of the CDSS including (i) end-user testing and (ii) prospective model performance. If successful, the CDSS will be implemented and deployed to evaluate its clinical utility.

[1] Huy NQ, Ming DK, An LP, Chanh HQ, Tam DTH, Trieu HT, Van Nuil JL, Paton C, Hernandez B, Georgiou P, Holmes AH, Yacoub S. Mapping patient pathways and understanding clinical decision-making in dengue

management to inform the development of digital health tools. BMC Medical Informatics and Decision Making. 2022 Aug 04 *[Under review]*

[2] Ming DK, Tuan NM, Hernandez B, Sangkaew S, Vuong NL, Chanh HQ, Chau NV, Simmons CP, Wills B, Georgiou P, Holmes AH. The Diagnosis of Dengue in Patients Presenting With Acute Febrile Illness Using Supervised Machine Learning and Impact of Seasonality. Frontiers in digital health. 2022 Mar 14;4.

[3] Ming DK, Hernandez B, Sangkaew S, Vuong NL, Lam PK, Nguyet NM, Tam DT, Trung DT, Tien NT, Tuan NM, Chau NV. Applied machine learning for the risk-stratification and clinical decision support of hospitalised patients with dengue in Vietnam. PLOS Digital Health. 2022 Jan 18;1(1):e0000005.

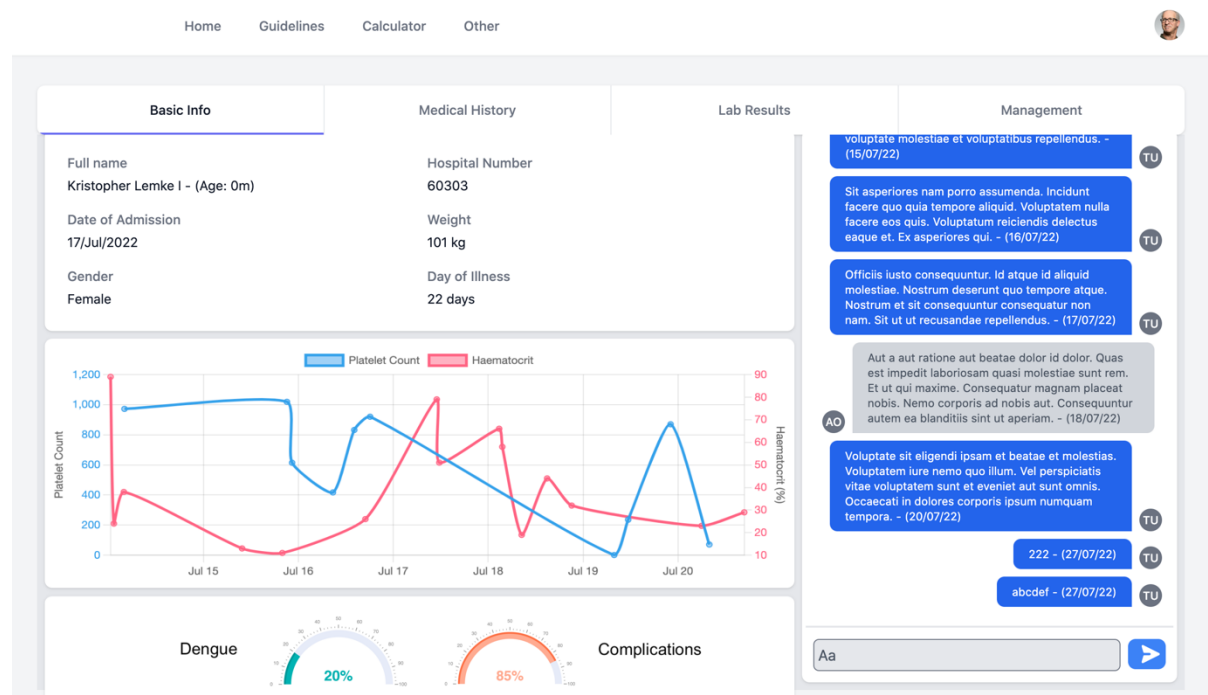Home   Guidelines   Calculator   Other

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[+ New Patient]

FULL NAME	AGE	ADMISSION DATE	LOCATION	PLC	HAE	LAST UPDATE
Search...		dd/MM/yyyy	All			
Kristopher Lemke I	18	17/07/2022	Follow up in OPD	71	29%	20/07/22 18:28
Wm Stoltenberg	20	15/07/2022	Observe in ED	111	30%	20/07/22 18:28
Kara Rempel	29	20/07/2022	Admit to ICU	937	24%	20/07/22 18:28
Alma Harris	24	13/07/2022	Follow up in OPD	1152	10%	20/07/22 18:28
Kristy Heaney	49	17/07/2022	Admit to ICU	380	62%	20/07/22 18:28
Marie Pagac	40	16/07/2022	Admit to ICU	244	75%	20/07/22 18:28
Tricia Barton	37	18/07/2022	Admit to ICU	880	88%	20/07/22 18:28
Sheldon Wintheiser	25	11/07/2022	Observe in ED	118	78%	20/07/22 18:28
Elbert Lubowitz	47	19/07/2022	Admit to Ward	777	19%	20/07/22 18:28
Dr. Karla Okuneva II	44	13/07/2022	Admit to ICU	6	58%	20/07/22 18:28

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Basic Info	Medical History	Lab Results	Management

Full name
Kristopher Lemke I - (Age: 0m)

Hospital Number
60303

Date of Admission
17/Jul/2022

Weight
101 kg

Gender
Female

Day of Illness
22 days

Platelet Count — Haematocrit

Dengue 20%   85% Complications

(Chat messages)

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