Technoleg Iechyd Cymru
Health Technology Wales

Topic Exploration Report

Topic explorations are designed to provide a high-level briefing on new topics submitted for consideration by Health Technology Wales. The main objectives of this report are to:

- Determine the quantity of evidence available for a technology of interest.
- Identify any gaps in the evidence.
- Inform decisions on topics that warrant fuller assessment by Health Technology Wales (HTW).

Topic exploration report number:	TER443
Topic:	A clinical decision support system with artificial intelligence (C the Signs) to facilitate early detection of cancer
Summary of findings:	C the Signs is a clinical decision support system designed to enable earlier cancer detection. In NHS Wales, universally standardised cancer referral forms, referral templates or referral criteria are not used. This can lead to variations, missing clinical information, and also inappropriate referrals or incorrect use of pathways. C the Signs uses artificial intelligence and is designed to standardise the referral process and facilitate compliance with local cancer referral pathways and National Institute for Health and Care Excellence (NICE) cancer guidelines. HTW researchers did not identify any peer-reviewed evidence on the use of C the Signs as a clinical decision support system to facilitate early detection of cancer. In addition, the evidence presented in this report is based on an earlier version of the technology, with a significantly different platform. The clinical and cost effectiveness of the newer version is unclear. A systematic review published in 2021 included eight artificial intelligence technologies for use in early cancer detection; however, no studies on C the Signs were identified and there was very little relevant data on any of the technologies. Furthermore, they are complex systems and it is unclear how they compare. An evaluation of C the Signs pilots in three clinical commissioning groups (CCGs) in the East of England reported increased detection and referral rates. Comparator groups were: the rest of the CCGs in the region that didn't adopt C the Signs (17 in total); and three CCGs from the region that were matched with the pilot CCGs, based on similar, previous performance on the measures of interest. No full economic evaluations were identified on the use of C the Signs for the early detection of cancer. However, the evaluation in CCGs reported a potential net saving over one year of £480,071 or £264,813 based on early diagnosis.

Introduction and aims

The importance of early diagnosis for improved cancer outcomes is evidenced in the literature and is a priority for the NHS. C the Signs is a clinical decision support system designed to enable earlier cancer detection. Since 2020, C the Signs has been fully integrated with primary care medical record systems, including Egton Medical Information Systems (EMIS), SystmOne and Vision, and is intended for use in primary and community care.

C the Signs uses artificial intelligence to support the early identification of the cancer(s) a patient is at risk of, and which investigation or referral may be appropriate. It stratifies patients according to their risk of cancer using signs, symptoms, demographic data, risk factors and other clinical markers.

In NHS Wales, universally standardised cancer referral forms, referral templates or referral criteria are not used. This can lead to variations, missing clinical information, and also inappropriate referrals or incorrect use of pathways. C the Signs is designed to standardise the referral process and facilitate compliance with local cancer referral pathways and NICE cancer guidelines. The dashboard tracks patient flow through the system, through follow-up and post-diagnosis care. It also provides real-time data to practices and clusters on their cancer data, including referral practices by tumour pathway, conversion rates, and detection rates.

Health Technology Wales researchers searched for evidence on clinical and cost effectiveness of C the Signs as a clinical decision support system to facilitate early detection of cancer.

Evidence overview

Clinical evidence

HTW researchers did not identify any peer-reviewed evidence on the use of C the Signs as a clinical decision support system to facilitate early detection of cancer.

A systematic review (Jones et al. 2021) included eight artificial intelligence technologies for use in early cancer detection (C the Signs, Abtrace, Babylon, Isabel, Medial EarlySign, Symcat, Symptomate, and an unnamed technology). However, only the Medial EarlySign tool was evaluated for its performance in the diagnosis or triage of potential cancer, with no data on time to referral or diagnosis. Most data was specificity and sensitivity. No studies on C the Signs were identified in the systematic review.

Hanlon et al. (2021) analysed Public Health England cancer referral data from primary care, covering a period of C the Signs pilots in three clinical commissioning groups (CCGs) in the East of England (July 2017-June 2018). Comparator groups were: the rest of the CCGs in the region that didn't adopt C the Signs (17 in total); and three CCGs from the region that were matched with the pilot CCGs, based on similar, previous performance on the measures of interest. Impact was measured using two indicators: the primary care cancer detection rate and the emergency presentation rate, used as a proxy for early diagnosis and late diagnosis, respectively. The pilot CCGs showed significantly greater increases in cancer detection rates compared to the pre-pilot year, relative to both comparators ($p<0.05$). A significant increase in the detection rate when compared to the matched CCGs was also reported ($p<0.05$). The authors highlighted that as improvements in cancer detection following referrals from primary care correlate strongly with early cancer detection, this is likely to represent diagnostic stage shift in the pilot CCGs. When compared to the rest of the CCGs in the region, there was a significant increase in the referral rates for the pilot CCGs between the pilot year and the previous year ($p<0.05$), with no significant difference when compared to the matched CCGs.

No statistically significant differences in emergency presentations or conversion rates were reported.

A previous report on early diagnosis interventions was published by Ipsos MORI Social Research Institute and York Health Economics Consortium (2019). This covered the same C the Signs pilots as Hanlon et al. (2021) and is included in the literature results below for completeness. However, it should be noted that there appears to be discrepancies between the two reports (see Areas of uncertainty).

Economic evidence

No full economic evaluations of C the Signs were identified. Hanlon et al. (2021) stated that assigning an economic value to early diagnosis (as compared to late diagnosis) shows a net saving over one year of £480,071 or £264,813 with a return on investment of 2.3 or 1.3 respectively, across the participating group of three CCGs (relative to the rest of the CCGs in the region and the matched CCGs, respectively. This indicates that for every £1.00 invested, there would be £2.30 or £1.30 of value.

Ongoing trials

No ongoing trials of C the Signs were identified in the HTW literature search, although the technology is being piloted in other regions and the Topic Proposer has highlighted prospective evaluations are being undertaken.

Areas of uncertainty

We did not identify any peer-reviewed evidence on the use of C the Signs as a clinical decision support system to facilitate early detection of cancer.

Since 2020, C the Signs has been integrated with electronic medical systems, including EMIS, SystmOne and Vision. However, the evidence presented in this TER was based on an earlier version, which is no longer licensed or commissioned. The new version involves a significantly different platform with new features and tracking. It is unclear how the new version would compare in terms of clinical and cost effectiveness.

A systematic review published in 2021 included eight artificial intelligence technologies for use in early cancer detection. However, only the Medial EarlySign tool was evaluated for its performance in the diagnosis or triage of potential cancer, with no data on time to referral or diagnosis. These technologies using artificial intelligence are complex systems and it is unclear how they compare. No studies on C the Signs were identified in the systematic review.

The evaluation report by Ipsos MORI Social Research Institute and York Health Economics Consortium (2019) included a number of early diagnosis interventions, and key achievements reported are not specific to C the Signs. It is unclear whether discrepancies compared to Hanlon et al. (2021) are due to earlier reporting of data.

Literature search results

Health technology assessments and guidance
NICE. (2015). Suspected cancer: recognition and referral. NICE guideline (NG12). National Institute for Health and Care Excellence. Available at: https://www.nice.org.uk/guidance/ng12 [Accessed 07 December 2022]. *NG12 does not specifically refer to C the Signs. Numerous NICE guidelines are available in relation to specific types of cancer.*
Evidence reviews and economic evaluations
Jones OT, Calanzani N, Saji S, et al. (2021). Artificial intelligence techniques that may be applied to primary care data to facilitate earlier diagnosis of cancer: Systematic review. Journal of Medical Internet Research. 23(3): e23483 doi: https://doi.org/10.2196/23483. *C the Signs was not the subject of any of the studies found. Seven other technologies met the inclusion criteria, but evidence was very limited.*
Individual studies
Hanlon J, Setters J, Payling M, et al. (2021). Accelerating early identification of cancer in primary care using an artificial intelligence driven solution. York Health Economics Consortium. Available at: https://transform.england.nhs.uk/media/documents/York_Health_Evaluation.pdf Ipsos MORI Social Research Institute and York Health Economics Consortium. (2019). RM Partners Evaluation: Early diagnosis interventions. Final annual report. Available at: https://rmpartners.nhs.uk/wp-content/uploads/2020/01/FINAL-RMP-Ipsos-Mori-evaluation-Nov-2019.pdf [Accessed 07 December 2022].
Ongoing research
We did not identify any relevant ongoing trials that referred to the technology.

Date of search:	December 2022
Concepts used:	Artificial intelligence; cancer; C the Signs; diagnosis; referral.