Impact of digital patient monitoring (DPM) on quality of clinical care of cancer immunotherapy (CIT)-treated patients with advanced/metastatic non-small cell lung cancer (a/mNSCLC)

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BACKGROUND

- Patients with advanced/metastatic non-small cell lung cancer (NSCLC) have a high symptom burden[1] and many cancer immunotherapy (CIT)-treated patients also experience treatment-related symptoms, such as fatigue, skin rash or itching, diarrhoea, nausea or vomiting, dyspnoea and cough.[2]
  - However, patients may find it difficult to recall detailed information on their symptoms during visits to their healthcare provider, which ultimately can affect efficient management of their disease.
- Digital patient monitoring (DPM) tools can facilitate real-time symptom reporting, enable direct patient communication with healthcare professionals (HCPs) and provide access to patient support materials,[3] all of which has been shown to improve patients' overall survival and quality of life, and to offer health-economic benefits by reducing hospital admission rates and the need for unscheduled HCP visits.[4-6]
- We conducted a proof-of-concept pilot study to assess use of our DPM tool, which was based on the generic CIT DPM tool developed by Kaiku Health (Helsinki, Finland), and its impact on quality of clinical care of CIT-treated patients with advanced/metastatic NSCLC (a/mNSCLC).

METHODS

- HCPs and 45 patients treated with second-line single-agent CIT from 10 clinics across Germany, Finland, and Switzerland participated.
- Literature search and separate advisory boards (HCP, nurses, patients) provided key insights used to co-develop a drug and indication-specific CIT module.
- HCPs were trained in the use of both the generic and indication-specific module in a 2-hour-long session.
  - Patients treated with a CIT drug other than atezolizumab used the Kaiku generic CIT DPM module, which included a symptom questionnaire (per the National Cancer Institute Patient-Reported Outcomes Common Terminology Criteria for Adverse Events with 18 questions specific to NSCLC CIT monotherapy treatment), direct message communication between patients and HCPs, disease-specific educational material, a symptom overview and alerts for HCPs, and patient self-care instructions for mild-to-moderate symptoms.
  - Atezolizumab-treated patients used a module like that described above, except that it included additional drug-specific educational material and prevalence data in the questionnaire feedback.
- Data were collected from online surveys and HCP interviews:
  - Data on user experience, overall satisfaction and impact of the tool on clinical care were collected after 2 months of DPM use (11 closed-ended multiple-choice or Likert Scale questions [with 5 as the maximum and 1 as the minimum agreement value] in English, Finnish or German).
  - In addition, data were collected in HCP interviews (14 open-ended questions) and an online survey (34 and 36 closed-ended multiple-choice or Likert Scale questions for patients and HCPs, respectively, in English, Finnish or German) at the end of the pilot study, after a minimum of 3 months. HCP interviews were recorded and transcribed into English before being coded and analyzed.[7,8]
  - Data from online surveys were anonymized and analyzed quantitatively.

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RESULTS

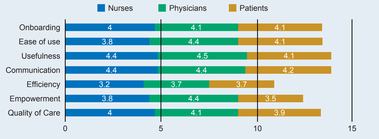
Survey respondents and HCP interviewees

- The numbers of survey respondents and HCP interviewees were as follows:
  - Interim survey – 51 respondents (13 nurses, 11 physicians and 27 patients).
  - End-of-study survey – 48 respondents (19 nurses, 8 physicians and 21 patients).
  - End-of-study HCP interviews – 19 HCPs (11 nurses and 8 physicians).

Satisfaction of interim survey respondents with the DPM tool

- Interim survey respondents were asked to rank the different attributes of the DPM tool (Figure 1).
  - Across all user groups, all attributes were ranked highly (range 3.2 to 4.5), indicating that there was a high level of satisfaction with the DPM tool; usefulness and communication were the highest-ranking attributes, and efficiency was ranked the lowest.

Figure 1. DPM tool user satisfaction among interim survey respondents



Data are the averages of the given values on a scale of 1 to 5 (with 5 as the maximum and 1 as the minimum value) for that user group.

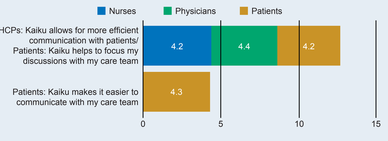
DPM tool usage and user proficiency in end-of-study survey respondents

- The majority of the end-of-study survey respondents (41/48 [85%]) used the DPM tool at least weekly; 29/48 respondents (60%) indicated that they used the tool for ≤10 min per week in the case of patients or per day in the case of HCPs.
- A total of 35/48 respondents (73%) considered themselves to be competent, proficient or expert users of the DPM tool.

Effect of the DPM tool on communication

- In the end-of-study survey, all user groups agreed that the tool facilitated more efficient and focused communication between patients and HCPs (Figure 2).

Figure 2. Effect of the DPM tool on patient–HCP communication for end-of-study survey respondents

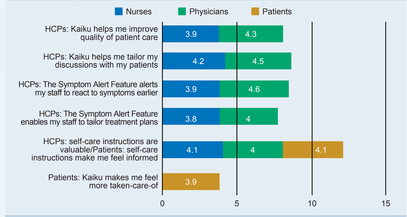


Data are the averages of the given values on a scale of 1 to 5 (with 5 as the maximum and 1 as the minimum value) for that user group.

Effect of the DPM tool on quality of patient care

- HCP end-of-study survey respondents agreed that the tool helped them to improve the quality of patient care by allowing them to tailor discussions with their patients and enabling earlier reaction to symptoms and personalisation of treatment plans (Figure 3).
- Both HCPs and patients valued the self-care instructions function, and the DPM tool made patients feel more taken-care-of (Figure 3).

Figure 3. Effect of the tool on quality of patient care for end-of-study survey respondents

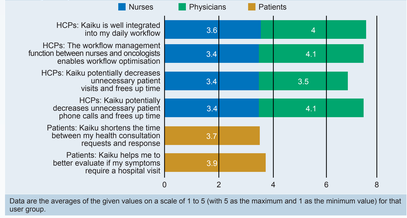


Data are the averages of the given values on a scale of 1 to 5 (with 5 as the maximum and 1 as the minimum value) for that user group.

Effect of the DPM tool on efficiency

- Ratings from the end-of-study survey respondents (Figure 4) showed that the DPM tool had the potential to improve efficiency by:
  - Enabling workflow optimisation between physicians and nurses (average HCP rating 3.75/5).
  - Freeing up time by decreasing the need for phone consultations (average HCP rating 3.75/5) and patient visits (average HCP rating 3.45/5).
  - Improving ability of patients to evaluate whether their symptoms require an earlier unscheduled outpatient appointment (patient rating 3.9/5) by prompting them to contact their HCP in cases of severe symptoms.
  - Shortening the time between health consultation requests and responses (patient rating 3.7/5).

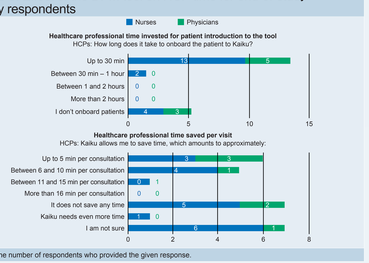
Figure 4. Effect of the DPM tool on efficiency of care for end-of-study survey respondents



Data are the averages of the given values on a scale of 1 to 5 (with 5 as the maximum and 1 as the minimum value) for that user group.

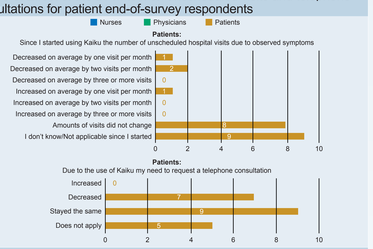
- Figures 5 and 6 detail the effect of the DPM tool on HCP time and on the need for unscheduled visits and telephone consultations for patients, respectively.
  - Most HCPs spent up to 30 min onboarding patients, and 22% of them saved <5 min, 19% saved 6–10 min and 4% saved 11-15 min per patient visit.
  - Most patients reported no change in the number of unscheduled visits or were unsure about the effect of the DPM tool, and 33% of patients reported a decreased need for telephone consultations.

Figure 5. Effect of the DPM tool on HCP time for end-of-study survey respondents



Data are the number of respondents who provided the given response.

Figure 6. Effect of the DPM tool on unscheduled visits and telephone consultations for patient end-of-survey respondents



Data are the number of respondents who provided the given response.

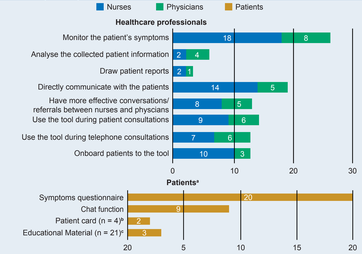
HCP expectations of the DPM tool

- HCP expectations of the DPM tool at the beginning of the study were met or exceeded for 24/27 HCPs (89%) who responded to the end-of-study survey.
  - The most prominent HCP expectations of the DPM tool at the beginning of the study were improved efficiency (mentioned by 8/19 interviewees) and quality of patient care (mentioned by 7/19 interviewees); these were also the most value-adding features of the DPM tool highlighted by HCPs at the end of the study.

Preferred functions of the DPM tool

- The functions of the DPM tool most commonly appreciated by HCPs who responded to the end-of-study survey were the patient symptom alerts (n = 26/27; 96%) and the message communication function (n = 19/27; 70%) (Figure 7).
- Similarly, the functions most commonly appreciated by patients were the symptoms questionnaire (n = 20/21; 95%) and the message communication function (n = 9/21; 43%) (Figure 7).

Figure 7. Functions most commonly appreciated by end-of-study interview participants



HCP, healthcare professional.
Data are the number of respondents who provided the given response.
*Patient responses were collected via the end-of-study survey.
†The patient card was offered only to patients receiving atezolizumab monotherapy (n = 4).
‡Educational materials were offered to all 21 patients.

- Ratings of the DPM tool's individual functions by the end-of-study survey respondents demonstrated that:
  - Patients felt empowered by the DPM tool as it made them feel more in control (patient rating 3.9/5), increased their feelings of safety during treatment (patient rating 3.9/5), and made them feel more secure in evaluating their own symptoms (patient rating 3.8/5).
  - HCPs believed the dashboard of the DPM tool gave them a compact overview of patient development (average HCP rating 4.3/5).
  - The lung cancer educational material was the most helpful and informative for all user groups (average user rating 4.3/5), followed by the videos for breathing exercises and CIT (average user rating 4.2/5).
  - The four respondents who received atezolizumab and were provided access to atezolizumab-specific material (the patient card, information on preparing for first infusion and treatment, and medication-specific material) rated this material 5/5, the highest rating given to any of the materials offered.

CONCLUSIONS

- The DPM tool demonstrated high user satisfaction and acceptance by HCPs and patients.
- The results highlight the contributions that DPM tools can make to the clinical care of patients with a/mNSCLC treated with CIT monotherapy.
  - These include educating and empowering patients, improving quality of care by enabling earlier reaction to symptoms and allowing personalisation of treatment plans, improving efficiency by freeing up time in patient visits and reducing telephone consultations, and overall facilitating more focused discussions between patients and HCPs.
- Further efficiency improvements might be possible e.g. by a seamless EHR integration.
- These findings add to the growing evidence base that DPM tools can improve patient management[4-6,9,10] and will allow us to continue to develop and improve the DPM tool to best serve the needs of HCPs and patients both in cancer and in other indications.
- Future studies or registries encompassing the use of our DPM tool may provide insights into any significant effects on patient survival or quality of life, or further health-economic benefits.

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CONFLICT OF INTEREST STATEMENT

Honoraria (self) – C.J. (F. Hoffmann-La Roche Ltd); J.K. (AstraZeneca, Bristol-Myers Squibb, Boehringer Ingelheim, Merck Sharp & Dohme, Novartis, Pfizer, Pierre Fabre, Roche and Takeda). Honoraria (institution) – M.G. (F. Hoffmann-La Roche Ltd). Advisory/consultancy – O.S. and B.L. (F. Hoffmann-La Roche Ltd [payment planned]); C.J. (external consultant for F. Hoffmann-La Roche Ltd to lead the study design, data analysis and reporting); S.I. (Bristol-Myers Squibb, Roche and Merck Sharp & Dohme); J.K. (AstraZeneca, Bristol-Myers Squibb, Boehringer Ingelheim, Faron, Kaiku Health, Merck Sharp & Dohme, Novartis, Pfizer, Pierre Fabre, Roche and Takeda); R.A.P. (Roche, Novartis, Merck Sharp & Dohme, Merck, Lilly, Bristol-Myers Squibb, AstraZeneca, Vifor Pharma and Nutricia [all paid to R.A.P.'s institution]). Speaker bureau/expert testimony – S.I. (Boehringer Ingelheim). Research grant/funding (self) – J.K. (Roche). Research grant/funding (institution) – S.I. (Roche), R.A.P. (Roche, Novartis, Sanofi, and AbbVie). Travel/accommodation/expenses – S.I. (Boehringer Ingelheim, Merck Sharp & Dohme, Roche, Novartis and Kaiku Health); J.K. (AstraZeneca, Bristol-Myers Squibb, Boehringer Ingelheim, Faron, Kaiku Health, Merck Sharp & Dohme, Novartis, Pfizer, Pierre Fabre, Roche and Takeda). Shareholder/stockholder/stock options – J.A. and A.K. (F. Hoffmann-La Roche Ltd). Full-/part-time employment – J.A. and A.K. (F. Hoffmann-La Roche Ltd); M.K. (part-time contractor for F. Hoffmann-La Roche Ltd). Support for third-party writing assistance – all authors (F. Hoffmann-La Roche Ltd).

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