BMJ Oncology

Choosing Wisely in oncology: are guidelines effective at preventing unnecessary diagnostics? The example of surveillance positron emission tomography for patients with localised colorectal cancer

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To cite: Goldstein DA, Tschernichovsky R, Razi T, *et al*. Choosing Wisely in oncology: are guidelines effective at preventing unnecessary diagnostics? The example of surveillance positron emission tomography for patients with localised colorectal cancer. *BMJ Oncology* 2024;**3**:e000391. doi:10.1136/bmjonc-2024-000391

► Additional supplemental material is published online only. To view, please visit the journal online (https://doi.org/10.1136/bmjonc-2024-000391).

Received 06 March 2024
Accepted 22 July 2024

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ABSTRACT

Objective Healthcare overuse is a major challenge for healthcare systems and patients worldwide. Professional guidelines such as the 'Choosing Wisely' guidelines have attempted to reduce specific examples of overuse. We examined the use of surveillance positron emission tomography CT (PETCT) in patients with colorectal cancer (CRC) treated with curative intent.

Methods and analysis We used the large Clalit Health Services dataset in Israel to identify patients with CRC who received adjuvant chemotherapy between January 2017 and December 2021. We examined the number of PETCTs performed for each patient.

Results We included 1799 patients in our study cohort. We distinguished localised from metastatic cases based on specific drugs administered or not administered during the follow-up period (ie, biologics). For the entire cohort, the median number of PETCTs performed per patient over the study period was 3364 (20.2%) patients underwent a single PETCT, 946 (52.6%) patients underwent ≥2 PETCTs and 25 patients underwent ≥10 PETCTs. If none or a single PETCT is considered 'guideline-concordant' during diagnosis and treatment of localised CRC, 69% of 4231 PETCTs performed were 'guideline-discordant'.

Conclusion Despite the professional guidelines recommending against routine PETCT to monitor for recurrence following curative-intent treatment of CRC, there remains a large volume of guideline-discordant PETCTs, constituting healthcare overuse of an expensive diagnostic procedure.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ It is known that professional guidelines such as 'Choosing Wisely' advise against the use of surveillance positron emission tomography CT (PETCT) in localised colorectal cancer. This study is important to evaluate whether such guidelines are successful in preventing the use of this surveillance approach.

WHAT THIS STUDY ADDS

⇒ In this retrospective analysis of 1799 patients with localised colorectal cancer, more than 50% of patients underwent more than 1 PETCT, considered unnecessary surveillance imaging.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study highlights the need for more proactive policy approaches in order to limit the use of unnecessary diagnostic procedures.

INTRODUCTION

In all healthcare systems around the world, using appropriate diagnostic approaches is important for both patients and payers. For patients, it is important to balance the need to diagnose serious disease, against the risk of overdiagnosis. For payers, the costs of using diagnostic testing must be balanced against the clinical benefit that the testing provides. For healthcare systems with finite availability of certain tests, the appropriate policy must ensure that such tests are available for those that need them. It has been well recognised that sometimes, there is overuse of certain diagnostic techniques. In order to provide a framework to consider such overuse, the 'Choosing Wisely' campaign was developed by the American Board of Internal Medicine, and its recommendations have been adopted by many professional organisations around the world.[1] The recommendations have been considered to be only for advisory purposes to guide clinician decision-making.

In the field of oncology, many 'Choosing Wisely' recommendations focus on the appropriate use of advanced imaging technologies such as positron emission tomography

(PETCT). One such recommendation specifically stated in 2013 '*Avoid using PET or PET-CT scanning as part of routine follow-up care to monitor for a cancer recurrence in asymptomatic patients who have finished initial treatment to eliminate the cancer unless there is high-level evidence that such imaging will change the outcome*'.[2] In the field of colorectal cancer (CRC), it is recommended that patients treated with surgery and adjuvant chemotherapy should not undergo surveillance with PETCT imaging. This recommendation against surveillance PETCT is supported by guidelines of the American Society of Clinical Oncology,[3] The European Society of Medical Oncology,[4] The National Comprehensive Cancer Network (NCCN),[5] American Society of Colon and Rectal Surgeons,[6] The Society of Surgical Oncology[7] and The Association of Coloproctology of Great Britain and Ireland.[8] The recommendations are underpinned by randomised controlled clinical trial data reported in 2018 by Sobhani *et al*.[9] In this study, 239 patients undergoing surveillance with physical examination, liver ultrasound, carcinoembryonic antigen (CEA) and CT were randomised to groups with or without PETCT every 6 months. There was no difference in rates of unresectable recurrence or death from any cause.

It is currently unknown how effective these non-binding guidelines are in reducing the overuse of such imaging approaches. An American study demonstrated the increasing use of surveillance PETCT in a cohort of patients with CRC prior to the launch of the Choosing Wisely campaign.[10] To the best of our knowledge, no data exist as to how effective the Choosing Wisely campaign and other professional guidelines are in their effort to reduce the use of surveillance PETCT imaging in patients with CRC treated with curative intent. Therefore, our objective was to analyse the usage of surveillance PETCT for patients with localised CRC who had received adjuvant chemotherapy with curative intent.

METHODS

Study overview

In this retrospective analysis, we identified patients with CRC and classified them as patients undergoing adjuvant therapy based on the anticancer systemic therapy that they had received. We then assessed how many PETCTs had been performed for each patient included in the cohort and remaining progression-free, from 90 days prior to the formal diagnosis until the end of follow-up in March 2023.

Study population

The study population included all patients, aged 18 and above, who are members of Clalit Health Services (CHS) and received a diagnosis of CRC between January 2017 and December 2021. CHS is the largest healthcare organisation that insures 52% of the entire Israeli population with 4.5 million members. Its comprehensive patient register is maintained in a central computerised database that includes demographic, clinical, hospitalisation, laboratory and all dispensed medication data. This provides a unique opportunity to assess the success of the Choosing Wisely guidelines on a national scale. The Clalit dataset became well recognised for its robust real-world analyses of preventative and treatment approaches for the COVID-19 pandemic.[11 12]

We included all patients in the cohort who were treated only with antineoplastic drugs that are part of the adjuvant FOLFOX, CAPOX or capecitabine regimens (5-fluorouracil, capecitabine and oxaliplatin) and were not treated with any biological agent typically administered in the metastatic setting (bevacizumab, cetuximab or panitumumab). In addition, the time from the beginning of treatment until the end of treatment was required to be no longer than 9 months, thus reflecting the nature of adjuvant therapy. Patients in this cohort were thus presumed to have stage 3/high-risk stage 2 disease, for which adjuvant systemic therapy is indicated for a confined treatment period. We excluded patients with metastatic disease if they had received backbone chemotherapy agents with the addition of one of the aforementioned biological agents. We excluded patients with a secondary malignancy as this could confound the results. We excluded patients with less than 12 months follow-up, as a short follow-up period may falsely suggest a lower than the actual number of PETCTs performed. Potential reasons for less than 12 months follow-up include death; movement from Clalit sick fund to another Israeli sick fund; emigration. Patients who were initially deemed to be in the adjuvant cohort based on drugs received and subsequently received a biological agent were removed from the adjuvant cohort as this would indicate that they had developed metastatic disease.

Data collection

For all patients in the cohort, we collected the following information: date of CRC diagnosis; average estimated glomerular filtration rate (eGFR) for each year during the study period; number and dates of PETCT scans performed from 1 October 2016 to 1 March 2023. In order to enhance our data capture, we included all PETCTs performed tracking back 90 days prior to the formal registered diagnosis of CRC. We collected demographic data including age, gender, ethnicity and socioeconomic score (SES). The SES was based on the small statistical areas (SSA) used in the 2008 Israeli census. These SSAs contain 3000–4000 people and were created in order to maintain homogeneity in terms of the sociodemographic composition.[13] The Israeli Central Bureau of Statistics used demography, education, employment, housing conditions and income to define the SSAs, and these were then grouped into 20 categories. These data were updated by the POINTS Location Intelligence Company[14] to improve the accuracy of the SES measure, using updated sociodemographic, commercial and housing data.[15] The entire CHS population was divided into 10 categories, ranging from 1 (lowest) to 10 (highest).

Sensitivity analysis

We performed a sensitivity analysis regarding the number of PETCTs that were considered to be guideline-concordant. The unavoidable problem in the method of our data capture is that some PETCTs performed around the time of diagnosis may have been for the purpose of staging rather than surveillance. Several guidelines specify loosely that staging PETCT is also unnecessary (and regular CT is sufficient). However, these staging directives are not as unequivocal as the surveillance directives. The purpose of our analysis was, therefore, to focus specifically on the issue of surveillance. As we were unable to clearly identify which PETCTs were performed for which purpose, we accept that some may consider that 1 PETCT (for staging) in the course of follow-up may be considered guideline-concordant. Additionally, sometimes, a PETCT is appropriately performed during surveillance in order to characterise a suspicious lesion. For this reason, we present the data with differing approaches as to the number of PETCTs that could be considered guideline-concordant.

Statistical analysis

All statistical analyses were performed by using R V.1.1. As patients with severe renal dysfunction cannot receive intravenous contrast, it may be considered acceptable to use PETCT instead of standard CT in certain patients.[16] In view of this, we performed an additional analysis removing all patients with an eGFR<30.

Patient and public involvement

Patients and the public were not involved in the research process.

RESULTS

The study cohort consisted of 1799 patients who underwent adjuvant chemotherapy for CRC (figure 1). Table 1 demonstrates the characteristics of these patients together with the number of PETCTs performed and the monthly interval that PETCT is performed. The median age of patients in the cohort was 66, and 54% of the cohort was male. Follow-up duration was a median of 3.6 years.

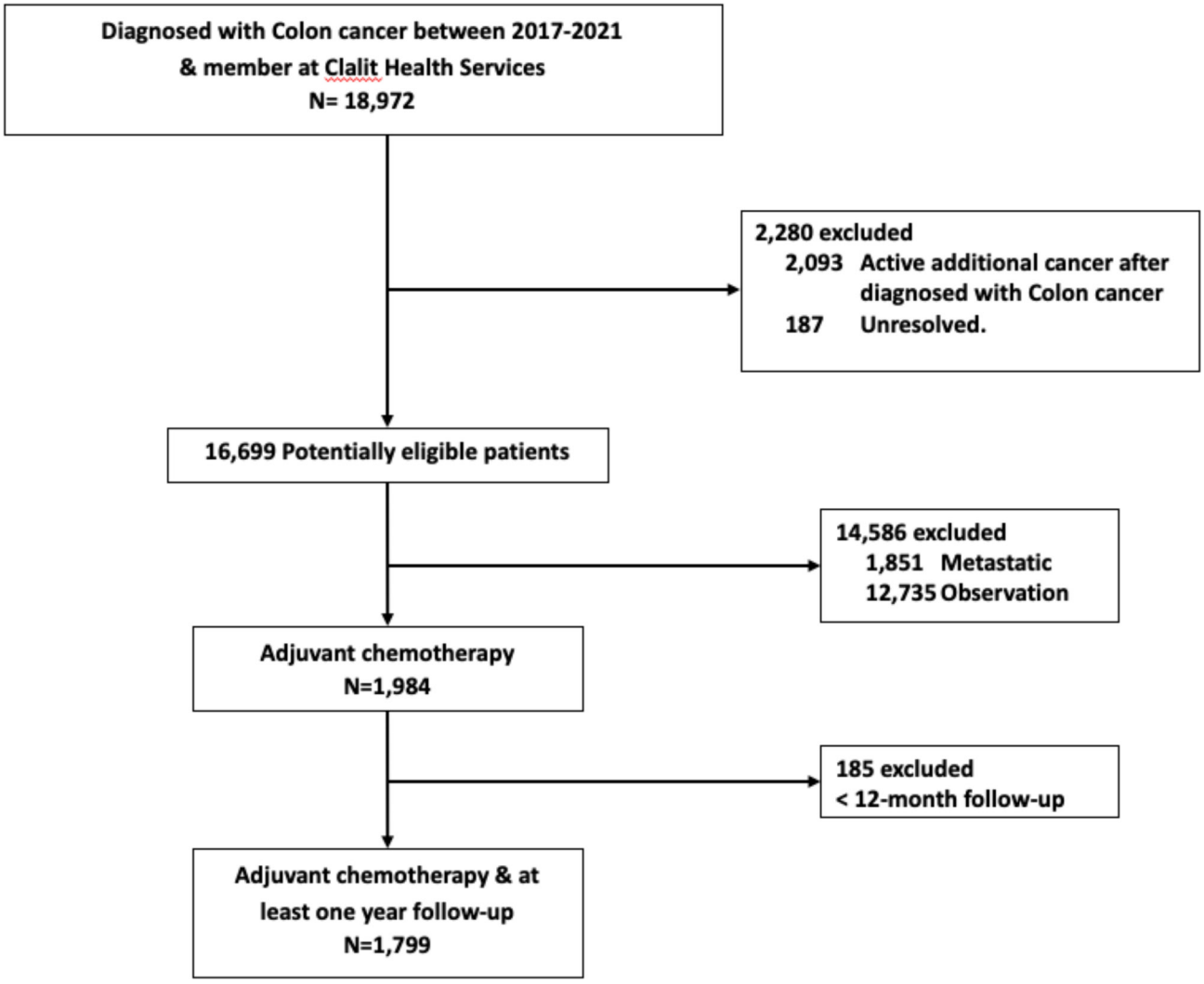

Figure 1 Selection of the study population.

Table 1 Patient characteristics

Characteristic	N=1799
Age, median (IQR)	66 (57–74)
Year of diagnosis, n (%)	
2017	437 (24)
2018	330 (18)
2019	317 (18)
2020	364 (20)
2021	351 (20)
eGFR<30, n (%)	18 (1.0)
Socioeconomic score, n (%)	
1 (lowest)	582 (33)
2	806 (45)
3 (highest)	397 (22)
(Missing)	14
Gender, n (%)	
Male	974 (54)
Female	825 (46)
Year of follow-up, median (IQR)	3.62 (2.38–5.13)
Total PETCT, median (IQR)	3 (1–4)
(No PETCT performed)	489 (27)
Interval between PETCT in years, median (IQR)	0.85 (0.41–1.50)

eGFR, estimated glomerular filtration rate; PETCT, positron emission tomography CT.

Figure 2 provides a breakdown of the number of PETCTs performed for each patient in the study. The median number of PETCTs was 3 with 489 patients (27.2%) not undergoing any PETCTs during the study period. 364 patients (20.2%) underwent 1 PETCT, and 946 (52.6%) patients underwent more than 1 PETCT. Notably, 25 patients underwent 10 or more PETCTs. In a sensitivity analysis (online supplemental figure 1), we present the results when patients with eGFR<30 are removed from the main cohort. These analyses demonstrate that the impact of removing this subset of patients only has a minor impact on the results.

In figure 3, we attempted to demonstrate how many of the PETCTs are guideline-concordant and guideline-discordant. However, there may be some debate as to the definition of concordant and discordant. For example, some consider that PETCT is appropriate at staging while others do not. As our data collection included all PETCTs performed, some may have been for the purpose of staging and need to be considered differently. Furthermore, sometimes it may be appropriate to follow a standard CT with a PETCT in order to characterise a suspicious lesion potentially informing clinical decision-making. Therefore, we present these data as pie charts, using a choice of definitions for guideline-concordant and discordant. When one PETCT is considered acceptable (eg, for staging), 69% of PETCTs performed are 'guideline-discordant'. When two PETCTs (eg, one for staging and one for characterisation of a suspicious lesion) are considered acceptable, 47% of PETCTs performed are 'guideline-discordant'.

We evaluated the average number of PETCTs performed annually according to year of follow-up, in order to assess whether there are any temporal trends in PETCT usage. The median number of PETCTs performed annually per patient per year of follow-up was 0.85 (online supplemental table 1). The results should be interpreted with caution due to differing amounts of follow-up.

DISCUSSION

Healthcare overuse is a recognised problem around the world, and different guidelines have attempted to address this problem. In this study, we explored robust real-world data relating to one particular example of imaging overuse. Despite multiple guidelines, including

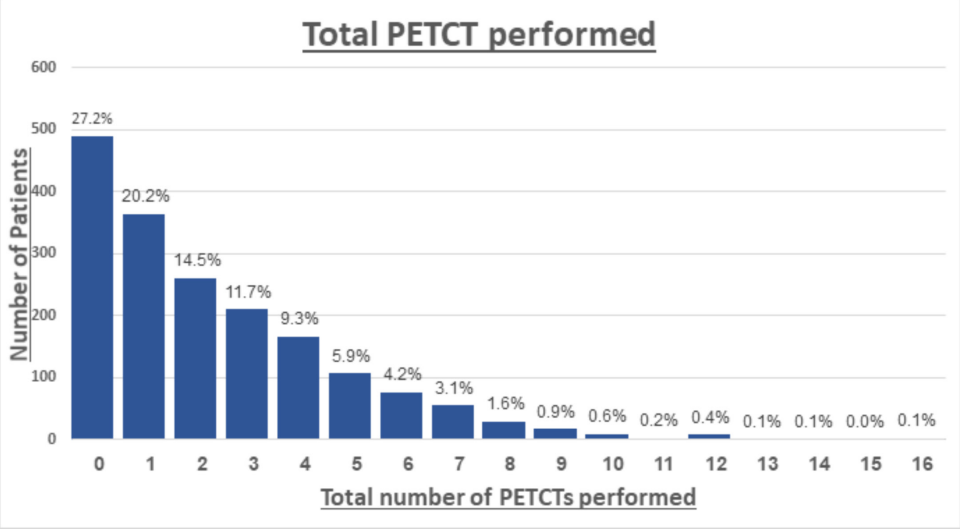

Figure 2 Total number of PETCTs performed per patient. PETCT, positron emission tomography CT.

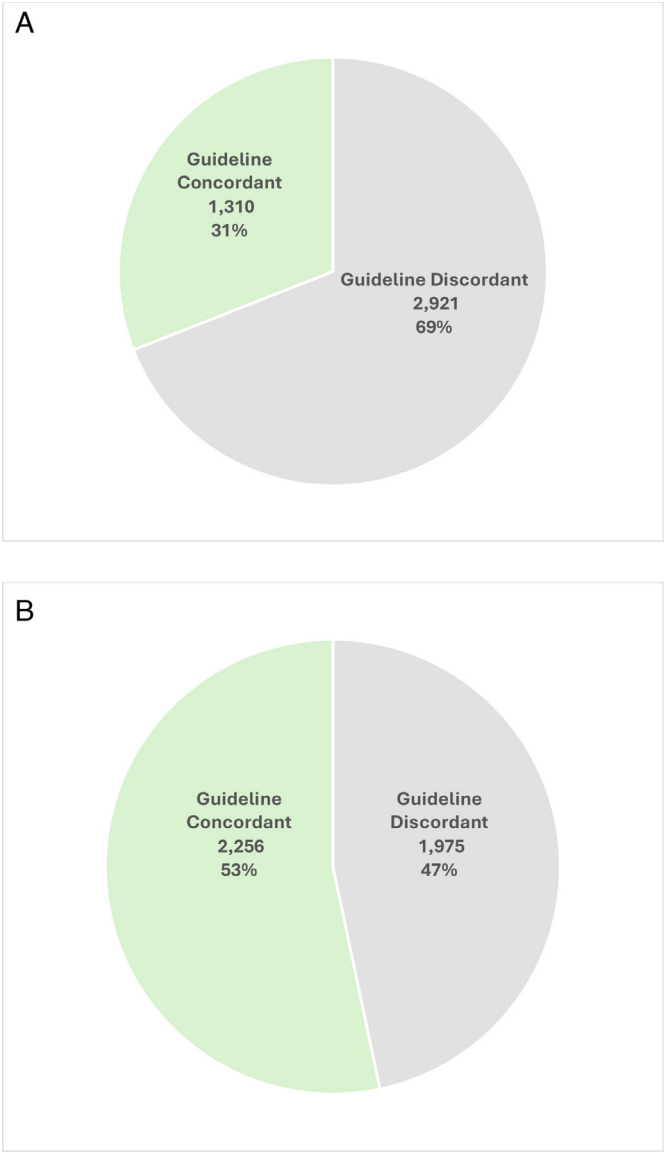

Figure 3 Pie charts demonstrating the proportion of PETCTs performed for the whole cohort that are guideline-concordant and guideline-discordant. As there are varying ways to interpret the guidelines, we provide three different methods to present the data. A conservative view is that there is never a need for PETCT, even in staging. Another view is that PETCT is acceptable once, in staging, illustrated in (A). A permissive view is that PETCT is acceptable twice—once in staging, and on one additional occasion for the purpose of characterising a suspicious lesion. This is illustrated in B. (A) One PETCT is considered guideline-concordant. (B) Two PETCTs are considered guideline-concordant. PETCT, positron emission tomography CT.

'Choosing Wisely', advocating against the use of PETCT for surveillance of patients with cancer treated with curative intent, we see widespread PETCT imaging. Notably, 489 patients do not undergo any PETCTs in the course of their treatment, which is guideline-concordant, and in line with the view that PETCT is not necessary routinely even at staging. 364 patients underwent 1 PETCT—presumably for the purpose of staging. However, patients undergoing more than one PETCT should usually be considered guideline-discordant. Almost half of the patients appear to be undergoing guideline-discordant surveillance. The financial impact of PETCT imaging is significant to most healthcare systems—for example, in Israel, according to the non-discounted price tariffs, CHS spends approximately US$70 million (ILS255 million) annually on PETCT imaging.

The Choosing Wisely guideline regarding this issue was published in 2013.[2] Why is inappropriate imaging still taking place, up to 10 years after the publication of these guidelines? There are multiple reasons. Perhaps some clinicians are not aware of the guidelines. Perhaps some clinicians perceive PETCT to be a superior test, despite no data to support such a claim in this setting. Perhaps some patients pressure clinicians to order a PETCT, also with the perception that it is a superior test. Perhaps some clinicians find it easier to independently review the PET images rather than CT images, given the colour enhanced view. Perhaps some clinicians are not aware of the significant difference in cost between PETCT compared with standard CT. Perhaps PETCT appointments are paradoxically more available for patients than regular CT scans. Perhaps clinicians perceive an improvement in PETCT technology in the intervening years since the Choosing Wisely guideline in 2013, rendering these guidelines less relevant.

What approach is necessary in order to decrease the use of unnecessary imaging? One could argue that the payer approval process should be more stringent, and not approve all PETCT requests, rather only in specific clinical circumstances. However, the challenge with this approach is that all clinicians worldwide suffer from large amounts of bureaucracy, and one must be very careful before considering introducing more paperwork and approval processes. Another approach would be to develop a far more extensive outreach and educational process than the current Choosing Wisely programme, in order to specifically educate clinicians about the overuse of such tests, and to request more consideration prior to ordering such tests. The downside of this approach is that if the clinician and patient do not have financial 'skin in the game', they may not adjust their practice accordingly, even when there is no clinical disadvantage for patients. It is likely that the most appropriate approach is a combination of a policy change in approval processes, together with educational outreach.

What does this study tell us about the 'Choosing Wisely' programme and other efforts by professional societies and guidelines, to reduce unnecessary medical testing? Cliff *et al* performed a systematic analysis evaluating 131 studies analysing the impacts of Choosing Wisely recommendations.[17] Of these 131 articles, 15% were in the field of oncology. They found that active interventions were more likely to generate intended results (65% vs 13%) as were interventions with multiple components. These approaches and guidelines are largely ineffective in fully solving the problem, on their own.[17 18] They will only be

effective when combined with educational programmes and perhaps also policy change.

As with all research, this study has some limitations. When calculating the total number of PETCTs performed, our results are likely an underestimation, due to the lack of long-term follow-up. For example, a patient diagnosed in December 2021 will only have 15 months of follow-up, until March 2023, in our analysis. To help to correct this limitation, we also calculated the interval of PETCT use per patient—for example, a patient undergoes a PETCT with an average interval of a specific number of months. We delineated patients as receiving adjuvant therapy based on the drugs that they received. However, it is possible that the cohort included an unknown number of metastatic patients who were precluded from biological agents for any reason, including poor performance status, KRAS/BRAF mutations and/or contraindications to bevacizumab (eg, coagulopathies). It should also be noted that using chemotherapy alone without the use of a biological agent is an NCCN-recommended standard of care option for the treatment of metastatic disease.[5] In any case, if these patients were included in our cohort, PETCT imaging would not be indicated either in their clinical situation of metastatic disease. This lack of support for routine PETCT imaging in the metastatic setting is declared in NCCN guidelines as follows: '*PETCT is not indicated with the exception of selected patients who are considered for image-guided liver-directed therapies for hepatic metastases (ie, thermal ablation, radioembolisation) or serial CEA elevation during follow-up*'.[5] While some US-based studies demonstrate significant proportions of metastatic patients not receiving biological therapy,[19–21] we believe that these studies are less relevant to the Israeli setting. Some of these studies included only elderly patients.[19 21] Additionally, financial barriers in the form of copays and deductibles form considerable barriers to compliance in the USA, however, this does not apply in Israel where these medications are fully funded publicly. It is possible that some PETCT scans were performed and paid for in the private setting, and thus not captured by the CHS database. However, if this was the case, it would mean that our data would be underestimating the level of overuse. Future studies could incorporate into the algorithm the receipt of colon resection surgery in order to increase the sensitivity and specificity of the algorithm to identify patients with localised disease. This study identified predominantly patients with high-risk stage 2 disease and stage 3 disease who received adjuvant chemotherapy. It is possible that clinicians are more sparing in their use of surveillance PETCT in patients with low-risk stage 2 disease.

Healthcare overuse is a significant challenge for patients, providers and payers around the world. Despite professional efforts to curb this problem, this study demonstrates that such efforts are so far unsuccessful in solving the problem. More consideration is required to strengthen the efforts to decrease healthcare overuse.

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Contributors Study design: DG, RT, TR and KF. Interpretation of results: DG, RT, TR, KF, IM and RA. Writing manuscript: DG, RT, TR, KF, IM, RA and DN. Final approval: DG, RT, TR, KF, IM, RA and DN. DG is the guarantor.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval The study was approved by the CHS Institutional Review Board (IRB), ID 0140-22-COM1. As this was a retrospective analysis of deidentified data, informed consent was not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data may be obtained from a third party and are not publicly available. Raw data are potentially available from approval by the Clalit data extraction committee.

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