Factors Influencing the Delivery of Cancer Pathways: A Summary of the Literature

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Abstract

Purpose: Issues on timely access to diagnosis and treatment for cancer patients are still common. Many countries developed cancer care pathways to standardise and improve the outcomes of the services. Despite the existence of the cancer pathways, health services are still struggling to deliver timely cancer care. The study aims to summarise the literature on cancer care pathways at the diagnostic and treatment phases. The objectives are to find factors influencing the delivery of cancer care pathways; to highlight any interrelating factors; to find gaps in the literature concerning areas of research; to summarise the strategies and recommendations implemented in the studies.

Design/methodology/approach: The study used a qualitative approach and developed a causal loop diagram to summarise the current literature on cancer care pathways, from screening and diagnosis to treatment. A total of 46 papers was finally included in the analysis, which highlights the recurring themes in the literature.

Findings: The study highlights the myriad areas of research applied to cancer care pathways. Factors influencing the delivery of cancer pathways were classified into different albeit interrelated themes. These include access barriers to care, hospital emergency admissions, fast track diagnostics, delay in diagnosis, waiting time to treatment, and strategies to increase system efficiency.

Originality/value: As far as the authors know, this is the first study to present a visual representation of the complex relationship between factors influencing the delivery of cancer care pathways.

Keywords: Qualitative mapping, cancer care pathways, diagnostics, treatment, access barriers, literature review

1. Introduction

A care pathway can be defined as a general clinical plan that maps the trajectory of the patient through the healthcare system (Altini *et al*., 2020; Schrijvers *et al*., 2012). As such, it involves many activities and can be seen as a complex adaptive system that responds to medical decisions, patient outcomes and local characteristics, among other factors. Indeed, care pathways are subjected to a complex interplay of factors that can be captured, for example using causal loop diagrams (Littlejohns *et al*., 2018; Sterman, 2000).

The importance of proper management and a clear understanding of the impact of care pathways in the quality of care is acknowledged in the literature (Allen *et al*., 2019). It is often argued that the input of patients, as well as healthcare specialists, is essential in the design of effective care pathways (Donetto *et al*., 2019). Whilst the design of care pathways to provide better patient experience and improved outcomes is an important area in the literature (Currie and Harvey, 2000; Lawson *et al*., 2006), this paper focuses on the analysis of the delivery of cancer care pathways to understand the complex interaction of factors that ultimately affect the quality of the service delivered to the patient.

Cancer is regarded as the second leading cause of death worldwide and accounts for approximately one in every six deaths around the globe (World Health Organization, 2018). It is estimated that half of the UK population will develop cancer in their lifetime (Queen Mary University of London, 2017).

Problems related to the availability and delivery of cancer care are common (Prager *et al*., 2018). The issues include the accessibility of cancer care services such as screening, diagnosis, treatment, and the unpredictability in the delivery of these services (Wang and Onega, 2015). Several countries have developed standardised pathways for cancer patients to address the latest issue and improve patient outcomes. Descriptions of standardised lung cancer pathways in Australia, the UK and Canada can be found in Department of Health and Human Services (2016); Lung Clinical Expert Group (2017); Cancer Care Ontario (2019), respectively. Elsewhere, standardised pathways for cancer care have been found to correlate with improved survival rates for patients with seven distinct types of cancer in Denmark (Jensen *et al*., 2017). The pathways also contributed to the reduction of the diagnostic interval, i.e. the time elapsed from initial presentation to final diagnosis (Weller *et al*., 2012). Some studies have associated the implementation of standardised cancer pathways with increased efficiency, improved outcomes, and higher patient satisfaction levels (e.g., Delilovic *et al*., 2019; Gesme and Wiseman, 2011). However, negative effects have also been identified, such as longer waiting times for patients competing for the same resources (e.g., Delilovic *et al*., 2019). This suggests that research on the implementation of stardardised pathways that use shared resources should also consider the different patient groups sharing the resources.

Patient profiles may vary, and even the experiences of similar patients may be significantly different. Generally, variations may be due to the underlying heterogeneity of a patient's physical health and behaviours, professional uncertainty, external constraints, or diffusion of new knowledge and practices (Alzahouri *et al*., 2008). For example, similar

patients may undertake distinct diagnostic procedures (Alzahouri *et al*., 2008); or the indications and the choice of emergency surgery procedures may vary according to local conditions (Bosscher *et al*., 2015). These uncertainties may further complicate an already involved decision making process, but one way to mitigate their influence is by designing tools and patient pathways that benefit from multidisciplinary team discussions (Bosscher *et al*., 2015).

A report from the Organisation for European Cancer Institutes Accreditation and Designation program suggested that different cancer centres tend to have different numbers of pathologies with dedicated clinical pathways (Saghatchian *et al*., 2014). The variation also exists in the implementation of pathways with waiting time targets. In the UK, the National Health Service (NHS) guidelines established maximum waiting times of 2 weeks from referral to outpatient appointment and 62 days from referral to first treatment (Department of Health, 2007).

Literature review studies have explored factors relating to cancer care delivery, albeit with different focuses. The effect of case management in cancer care could not be ascertained due to the scarcity of literature and variations in methodology (Wulff *et al*., 2008). On the other hand, delays due to both the practitioner and the patient have been correlated with similar risk factors, such as demographic, socio-economic, education, and health conditions (Macleod *et al*., 2009). In addition, the lack of knowledge about cancer symptoms and the benefits of treatment were found to influence the delays in accessing the service (Akuoko *et al*., 2017; Jones *et al*., 2014; Williams *et al*., 2019).

The aforementioned literature studies have investigated factors related to either delay in the presentation or diagnosis and treatment. In contrast, this study aims to summarise the literature on the delivery of

cancer care pathways, covering the studies from presentation to diagnosis and treatment. The objectives include investigating the factors associated with the timely and effective delivery of the cancer pathways, highlighting any interrelating factors, summarising the implemented strategies for delivering cancer pathways, and reporting gaps in the literature.

2. Methodology

The literature search was conducted in March 2020 and covered SCOPUS, Science Direct, MEDLINE, PubMed, Web of Science, and PMC. The search used the following keywords: cancer* AND ("diagnostic pathway*" OR "patient pathway*" OR "care pathway*" OR "critical pathway*" OR "care map*" OR "clinical pathway*"). We constrained ourselves to studies written in English in the last 20 years. We excluded studies that covered topics related to testing devices, development of tools, genetic testing, tumour growth, and surgical procedures. The quality of the papers was not considered. The selection process was administered by the lead author. The result was presented, discussed, and disseminated to the team members who gave suggestions and contributed to the writing of the paper.

Figure 1 summarises the selection process. The first filter identified 1,969 potential studies. This number reduced to 296 following the removal of duplicates and screening based on titles and abstracts. It was further trimmed to 151 after excluding content that did not comply with the inclusion criteria. Finally, 105 studies were excluded due to reasons such as being related to palliative or supportive care and not concerning the delivery of cancer pathways. This resulted in the selection of 46 papers for further analysis.

2.1. *Causal loop diagram for cancer care pathways*

Causal loop diagrams (Sterman, 2000) are a system's dynamics tool developed to convey the interplay of factors in complex social systems by promoting a holistic view of the problem at hand. The rationale is to develop a diagram that conveys the existing relationships between pairs of factors to unveil a complete picture of the system to stakeholders and decision-makers.

The present study develops a causal loop diagram to highlight the causal link or relationship between each pair of factors/topics (also dubbed *variables*) investigated in the studies. In order to simplify the analysis whilst also retaining the essence of the articles, we make use of the topics that appear more frequently across all studies. The links between pairs of factors (variables) are represented by arrows in the resulting diagram. The arrows may be non-directional, when the relationship exists but no causality is attributed. Another type of arrow is uni-directional when the direction of causality is established. This type of arrow will have polarity (i.e. an established direction). The diagram does not capture any bi-directional relationship, since such a type of relationship was not found in the studies. It is important to note that the use of the tool is to facilitate the description of relationships between factors. These may not necessarily represent causality.

The factors were selected from the surveyed studies, as well as their pairwise relationships. For the sake of illustration, consider for example a study by Hansen *et al*. (2008) that investigated factors related to delay in cancer diagnosis. The study found that patients' socio-economic situation and age correlated with the delay in cancer diagnosis. Based on these results, the socio-economic and age factors were linked to patient delay in the diagram, see Figure 9.

The causal loop diagram was built using the software Vensim PLE, version 7.3.5 from Ventana Systems Inc (https://vensim.com). Individual analyses of specific themes were also carried out to describe pertinent variables following the surveyed literature.

3. Results

Figure 2 highlights the number of works published yearly from 2008 to 2020. It displays an upward tendency in the number of yearly publications from 2012 to 2018, which might indicate an increasing interest in the subject. Interestingly, no publications were found in 2009 and 2010, which is not to say that no research was conducted in that period. Overall, quantitative research was more prevalent than qualitative research.

Figure 3 presents the classification of the literature based on the types of services and cancers found in the literature. The number of papers dealing with 'Diagnostics' stands out (n = 27), followed by studies concerned with 'Treatment' and 'Screening' (n = 7 and n = 6, respectively). The category 'Other' included studies related to efficiency and emergency admissions (n = 4). Studies on diagnostics mainly involved multiple types of cancer. We identified five emerging and important themes related to cancer care services, namely hospital emergency admissions, fast track diagnostics, efficient delivery of cancer care services, delay in diagnosis and waiting time to treatment, and barriers to care. Figure 4 shows the distribution of these themes according to the cancer specialties. Delay in diagnosis and waiting time to treatment is the most common theme in the surveyed studies (n = 15), followed by efficient delivery of care services (n = 10). The next most frequent theme is fast track diagnostics (n = 8), followed by access

barriers to care (n = 7). Studies on fast track diagnostics mainly covered multiple cancer types (n = 5). Finally, the majority of lung cancer studies explored issues related to delay in diagnosis and waiting time to treatment (n = 5).

The derived causal loop diagrams feature emerging themes. Further analyses describe the relations between factors in the form of causal trees. Each subsequent subsection conveys a causes tree related to a specific theme and further discusses the theme. The theme *delayed diagnosis and waiting time to treatment* is further split into *delay in diagnosis*, and *treatment delay*. Given the complexity of the problem, each individual causes tree may fail to capture the intricate connections among variables, as there may be common factors that influence multiple themes. However, the discussion will be general enough to cover other parts of the diagram related to the theme.

To complement the analysis concerning individual themes, Appendix A features a comprehensive picture of the system as a whole in the form of a causal loop diagram. It conveys the relationship among distinct influences of different themes, as well as the connections between the themes in terms of common influences. Even though we cannot claim that the resulting diagram is a complete picture of reality, it depicts the perceptions of the surveyed studies regarding the complex issues connected to the delivery of cancer care.

3.1. Access barriers to care

Figure 5 presents a causes tree highlighting factors that can compromise the access to cancer care services. Administrative barriers include poor communication and service configuration, as well as the lack of a uniform service standard for all patients (Cusimano *et al.*, 2019). Anxiety may result from a poor relationship between doctor and

patient (Clarke *et al*., 2014), from the natural apprehension regarding a possible cancer diagnosis (Huddy *et al*., 2016), or the increased tension due to a delayed diagnosis (Nessim *et al*., 2015).

Obesity and other co-morbidities may affect the access of patients to the point of care and produce delays in the diagnosis (Guldbrandt *et al*., 2015). Obesity in particular has been associated with stigma and poor communication on the part of the service provider (Cusimano *et al*., 2019). The cultural reluctance in seeking help contributes to delay in diagnosis and treatment, which may lead to patients presenting with late-stage cancer (Huddy *et al*., 2016).

Concerning financial aspects, patients from deprived areas have been found more prone to late-stage diagnosis (Maclean *et al*., 2015) and more likely to require emergency care (Maringe *et al*., 2018). Somewhat correlated are geographical factors, such as the distance to the available cancer centres (Turner *et al*., 2017), the area of residence of patients (Maclean *et al*., 2015), which is also correlated to deprivation indices (Tin Tin *et al*., 2018; Tsang *et al*., 2013) and the availability of diagnostic procedures and treatments in the vicinity (Huddy *et al*., 2016). Unsurprisingly, longer travel times to cancer centres and residing in a deprived area are associated with poorer patient outcomes.

The knowledge of patients regarding the cancer types, the treatments, and the awareness concerning the benefits of early treatment, play an important role in the outcomes (Redaniel *et al*., 2015; Momberg *et al*., 2017). Better informed patients tend to make better decisions regarding screening and diagnostic strategies, thereby improving early presentation indices. Finally, the understanding and trust underlying the patient-doctor relationship are also important to accelerate diagnosis and

thereby improve outcomes, particularly in paediatric cancers (Clarke *et al*., 2014).

3.2. Efficient delivery of care pathways

Figure 6 summarises strategies proposed and implemented to deliver improved and faster pathways. Generally, developing a cancer pathway involves prescribing performance measures and planning in accordance with these measures for post implementation and monitoring. Efficient delivery, in turn, demands leadership, coordination, information technology systems, and governance (Pitter *et al*., 2019).

Multidisciplinary teams have a leading role in cancer care delivery. Because of this importance, multidisciplinary team meetings should be held frequently to avoid delays in diagnosis (Redaniel *et al*., 2015; Van Huizen *et al*., 2018). The literature suggests that a well-defined hierarchy can contribute to speed up treatment decisions and develop automated decisions for simple cases (Lamb *et al*., 2014; Redaniel *et al*., 2015). For rare cancer types, information technology can help identify courses of treatment when specialists are scarce (Kasper *et al*., 2018).

Rapid one-stop pathways have also been demonstrated effective for certain types of cancer (Bass *et al*., 2018; Haddow *et al*., 2016), and cost-effective in a more generalist setting (Sewell *et al*., 2020). Also essential for the delivery of a care pathway is the existence of early intervention or screening programs (Cariou *et al*., 2018) and the proper definition and application of standardised pathways (Hoverman *et al*., 2011; Kubal *et al*., 2016; Quan *et al*., 2012). This is to ensure that personalised diagnostic plans are coherent and independent of the team overseeing the pathway, and that the best experiences are shared with management and fellow specialists.

Finally, effective delivery of care requires administrative support that ensures seamless access to associated services such as psychological assistance (Franchi *et al*., 2013) and rehabilitation services (Stout *et al*., 2019). The administrative support may be a part of the cancer service which acts as a bridge between the cancer service and the associated service that is required. These supportive services may not have direct impact on the delivery of cancer pathways, nonetheless they provide support which may improve patients' experience.

3.3. Hospital emergency admission

Figure 7 depicts the main factors that contribute to hospital emergency admissions, according to the reviewed literature. These include age, deprivation, and comorbidity with other physical illnesses (Kreys *et al*., 2014; Maringe *et al*., 2018; Tsang *et al*., 2013).

Emergency visits can follow a GP referral (Black *et al*., 2015; Guldbrandt *et al*., 2015) or be completely unplanned (Ortiz-Ortiz *et al*., 2016). In the context of cancer pathways, unplanned emergency visits are in general a symptom of a failure in the proper delivery of care that results, for example, in late-stage diagnosis. Hence, proper prevention and screening policies (Cariou *et al*., 2018) as well as improved cancer awareness in primary care can help mitigate hospital emergency admissions in cancer care (Kreys *et al*., 2014; Tsang *et al*., 2013), provided that proper care is available for the patient (Turner *et al*., 2017).

3.4. Fast track diagnostics

Figure 8 summarises the factors associated with the implementation of fast track cancer pathways. Reported benefits of fast track programs include shorter diagnostic intervals and faster access to first treatment, as well as standardised protocols for a referral to secondary care (Guldbrandt *et al*., 2015; Jensen et al., 2014; Prades *et al*., 2011; Sewell

et al., 2020). However, the results reported in the literature are often myopic, for they fail to consider the additional burdens imposed on non fast track patients. Unfortunately, the latter group is comprised of the majority of patients (Zhou *et al*., 2018).

Fast track services often resort to dedicated resources and prioritised use of installed capacity which intuitively lead to better delivery of care for prioritised patients (Jakobsen and Jensen, 2016; Van Harten *et al*., 2018). However, it is important to contrast such an improvement with the eventual degradation of the delivery of care for non-prioritised patients.

3.5. Delay in diagnosis and waiting time to treatment

Figure 9 highlights the contributing factors to the delay in diagnosis. As expected, there are some overlaps with the factors that lead to efficient delivery, which would be expected to prevent unnecessary delays. Figure 10 highlights the main issues that contribute to the pre-treatment and post-diagnostic delays, according to the surveyed literature.

Early diagnosis and treatment are of the utmost importance in cancer care, hence it is no surprise that time to first treatment and time to diagnosis are among the performance functions evaluated in cancer care (Black *et al*., 2015; Nessim *et al*., 2015). Delayed diagnosis can be due to administrative and systemic issues, primary care delivery, or patient related issues (Hansen *et al*., 2011). Patient delays are correlated to socio-demographic characteristics, such as gender, awareness of cancer, economic status, alcohol intake, and tobacco consumption (Hansen *et al*., 2008; Huddy *et al.* 2016; Lim *et al*., 2014).

System delay may stem from unnecessary or delayed diagnostic procedures (Chiarelli *et al*., 2017; Laerum *et al*., 2020; Héquet *et al*.

2017) but also from a tendency of admitting late-stage patients in the system (Forrest *et al*., 2014; Nessim *et al*., 2015; Redaniel *et al*., 2013). Unsurprisingly, better communication between primary and secondary care, and better qualified personnel can help mitigate system delay (Black *et al*., 2015). Administrative issues include mismanagement of patient transfers between services and levels of care (Iachina *et al*., 2017), as well as inadequate management of referral, consultation, and booking for treatment (Stokstad *et al*., 2019; Wasserman *et al*., 2015).

A central nurse-led coordination of cancer care has been associated with improved outcomes and better delivery of cancer services (Aarhus *et al*., 2019; Blakely *et al*., 2015; Wulff *et al*., 2012). One possible reason for this is the proximity and empathy between nurses and patients (Tod *et al*., 2015).

4. Discussion

The study has identified literature pertaining to factors as well as strategies associated with the delivery of cancer care pathways from presentation to diagnosis and treatment. The analysis using qualitative mapping, in this case a causal loop diagram, revealed that factors and strategies are interlinked. It highlighted the complexity of the cancer care pathways in general, and that factors influencing a certain part of the cancer care pathway may also affect other areas in the pathway.

Access barriers to care are acknowledged in many passages of the surveyed literature, and the issues that lead to such barriers are important to both primary and secondary care. Studies that investigated access barriers sometimes have done so from the perspective of individual patients and other times have contemplated the perspective of the service providers. Factors associated with access barriers, from the patient

perspective, include socio-economic status, demographic profile, or comorbidity with other physical health conditions. These support previous reviews, such as Macleod *et al.* (2009) and Williams *et al*. (2019). The literature showed that these factors are not only associated with access to primary care but also with hospital emergency access (Tsang *et al*., 2013) or even hospital admissions in general.

Lack of knowledge about a certain cancer program available in the community or regarding cancer itself is a recurring theme in the literature. Such knowledge is invaluable not only for the population at risk but also for health professionals (Williams *et al*., 2019). It is not difficult to see that a lack of understanding about the benefits of screening programs for certain types of cancer, or about the associated diagnostic procedures, can affect the decision of individual patients on whether or not to join screening initiatives (Momberg *et al*., 2017). In a certain ethnicity, the lack of knowledge and awareness of cancer can be found in both developed countries (Jones *et al*., 2014) or developing countries (Akuoko *et al*., 2017).

Studies have identified a system of healthcare factors associated with the delivery of the cancer care pathway. In general, these might relate to resources such as availability of certain diagnostic procedures or treatments, the availability of experts in rare cancers, the management of diagnosis and treatment pathways, the communication between health professionals and the patients, and between service providers. These factors highlight gaps in accessing quality care in some European countries (Kasper *et al*., 2018). Multidisciplinary support via multidisciplinary team meetings play an important role in cancer care delivery (Lamb *et al*., 2014; Van Huizen *et al*., 2018). The effectiveness of the multidisciplinary teams depends upon the implemented strategies.

These include prioritising cases based on the type and condition of the tumour and making decisions for simple cases based on a standardised cancer pathway (Lamb *et al*., 2014).

Patient related factors together with the healthcare system contributed to delays in diagnosis and receiving first cancer treatment (Hansen *et al*., 2011; Huddy *et al.*, 2016). Raising cancer awareness in the community, and better coordination and communication between service providers are amongst suggested strategies to mitigate the delays (Black *et al*., 2015).

The study did not limit the delivery of care pathways for specific cancers or services. The results showed that at a high-level abstraction, factors influencing delivery at a certain phase of cancer care might be similar regardless of the cancer types. The analyses give insights into the complex care pathways, capturing not only primary care but also secondary and even tertiary care. As a result, the study presented a preliminary model toward a comprehensive description of factors and strategies influencing cancer care processes. Such a model, which provides a comprehensive knowledge regarding the cancer care pathways, may support the decision making process (Butler *et al*., 2013).

Finally, an apparent gap in the literature is the lack of studies analysing the holistic effects of cancer pathways in the health system (Zhou *et al.*, 2018). In particular, the literature lacks studies evaluating the decrease in the quality of service for patients competing for the same resources when cancer care is prioritised.

4.1 Strategies and recommendations

Although some findings in the literature are limited to a given setting, this section exploits recurring conclusions that can be used to inform policy making in general and help optimise cancer care pathways.

Firstly, it has been found that cancer awareness is positively correlated with improved outcomes and early presentation. Hence, we recommend developing policies to raise cancer awareness in the community, as well as continuous training and information exchange with healthcare professionals in primary care. Early intervention and screening plans are also very important to ensure early presentation. The intervention should be tailored to the context and address an individual's issues related to access barriers (Detterbeck *et al*., 2013).

Multidisciplinary teams and discussion boards should also be included in the pathways to improve outcomes and recommendations. However, these discussions should be frequent enough to prevent these meetings from becoming a bottleneck that delays diagnosis. The multidisciplinary teams should establish automated decisions for simpler cases to speed up diagnosis. This may be supported by extending the role of the cancer nurse specialists in the multidisciplinary teams.

Pathways should be standardised to ensure that diagnostic plans are independent of the team overseeing the pathway, and information exchange should guarantee that the best experiences are shared with management and fellow specialists. The pathways should provide a comprehensive cancer care program, be implemented, and subject to regular update (Christensen *et al*., 2017). In addition, proper information technology (IT) support and rapid access to associated services such as psychological assistance and rehabilitation services should be ensured to improve outcomes.

Finally, fast track diagnostics should be considered to speed up treatment decisions. However, the planning of a fast track service should consider the impact to all patients that make use of the shared resource that would be prioritised, to make sure that the overall effect is positive.

To avoid delays, preemptive measures should also be considered to prevent delays related to socio-economic and demographic characteristics. Finally, a channel should be stablished between primary and secondary care, as such a channel has been associated with delay mitigation (Brown *et al*., 2014).

4.2 Study limitation

Due to the keywords and inclusion criteria used for the literature search, the study may not have covered the literature in its entirety. The search was limited to articles published in journals. Future studies may update this effort and include grey literature such as policy and organisational reports.

The resultant causal loop diagram model was developed using combined factors and strategies discussed in the included studies. In addition, the quality of each study was not assessed and has not been taken into account in the analysis. Hence, the resulting diagram might capture the subjectivity of the authors in summarizing the results, as well as biases found in the studies. Further research might contest and refine the model by including more evidence from studies. Others might take some ideas presented in the model and turn them into a quantitative model that can be used to investigate the interrelationship between the factors. Such a quantitative model might capture not only the patient flow in the cancer care system but also the factors influencing the flow.

The study is limited to cancer care pathways in relation to diagnostic and treatment delivery. Factors related to patient outcomes such as survival and quality of life were not included. Future studies may include literature discussing patient outcomes in relation to cancer care pathways. The inclusion of such literature may highlight the important

links between other support care pathways and the diagnostic and treatment care pathways. This would be a step towards capturing a holistic view of healthcare systems in cancer care.

5. Conclusion

Factors influencing the delivery of cancer pathways are myriad and complex. In general, the factors may relate to the individual patient or the system of care. Factors such as patient characteristics, socio-economic conditions, knowledge of cancer and cancer symptoms are interrelated and influence different cancer services. The results not only highlighted the factors associated with delay in diagnosis or treatment, but also the strategies proposed in the literature to deliver timely cancer pathways, such as fast track diagnostics.

The successful delivery of cancer pathways was supported by factors such as IT and information systems, multidisciplinary teams, and case management, among others. However, the number of studies found is not large, especially with respect to specific cancer types. More studies are needed on the successful delivery of cancer pathways, particularly focusing on specific cancer types, as different cancers require distinct cancer pathways.

This study provided, by means of a causal loop diagram, a comprehensive picture of the factors influencing cancer care. The resulting model developed in the study can be regarded as a preliminary model representing complex cancer care pathways. Future studies should confirm or mitigate the links between factors by including up-to-date evidence. The findings give rise to recommendations and insights that can guide practitioners in the development of new and the refinement of existing cancer care pathways.

Conflict of interest

None.

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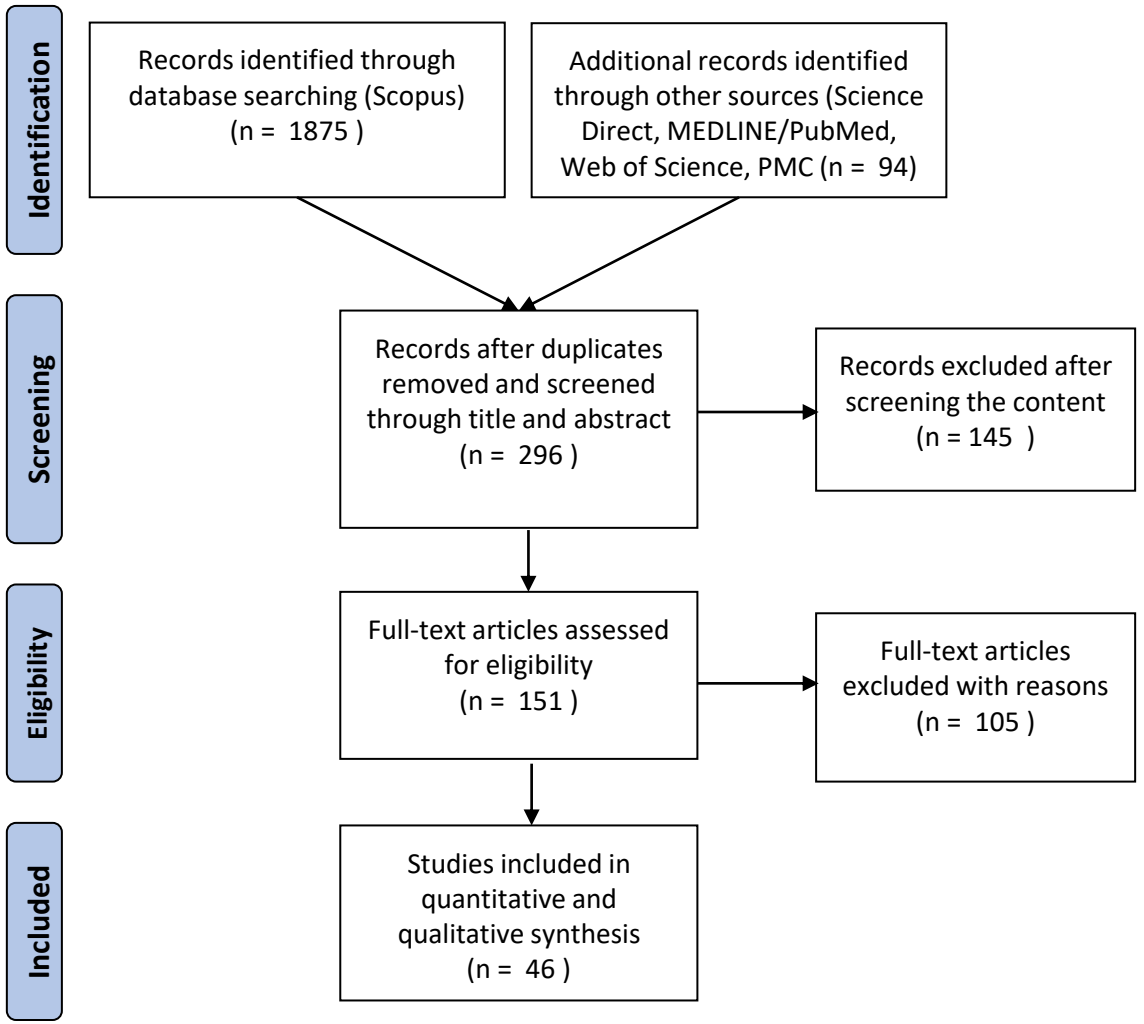
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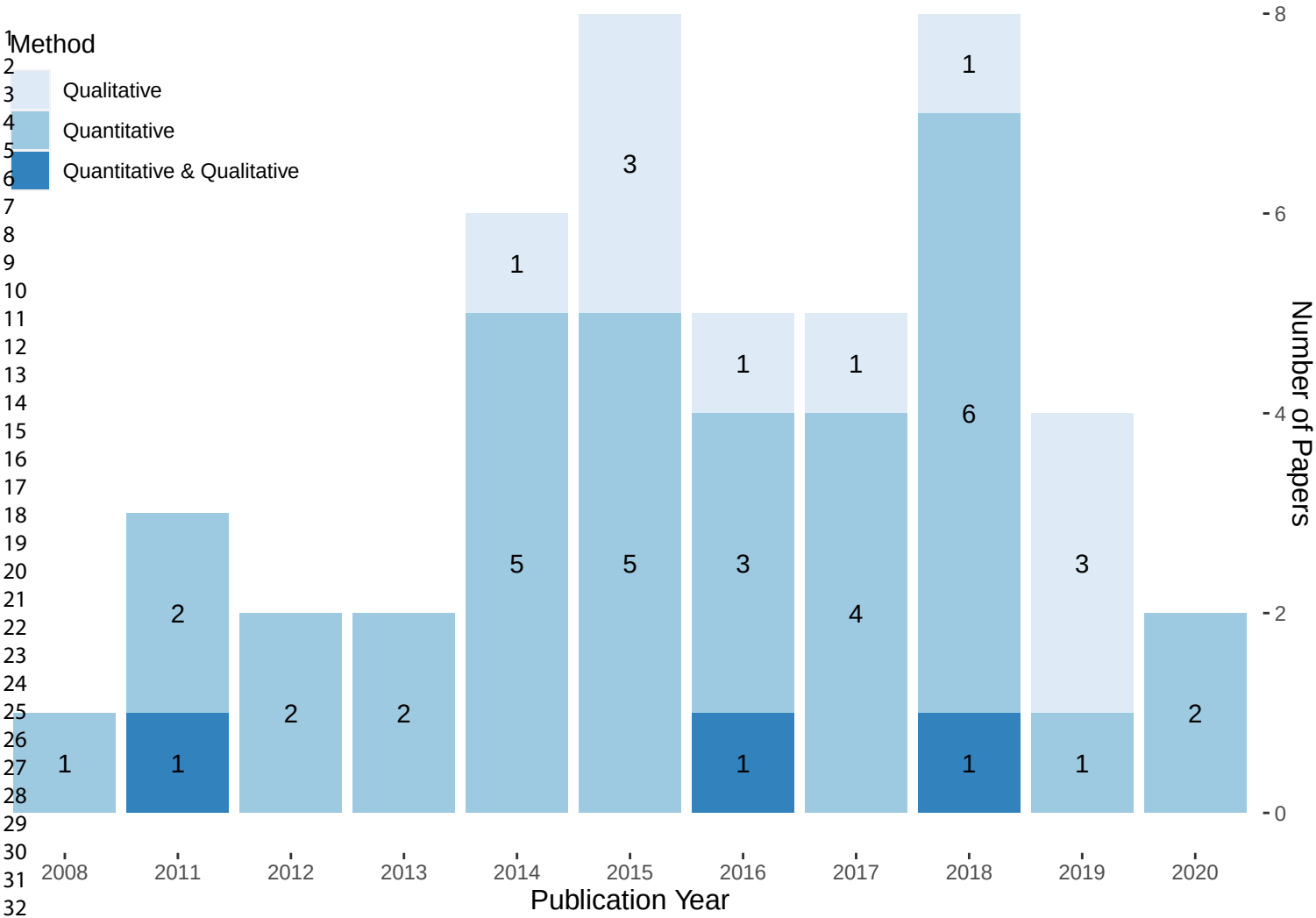
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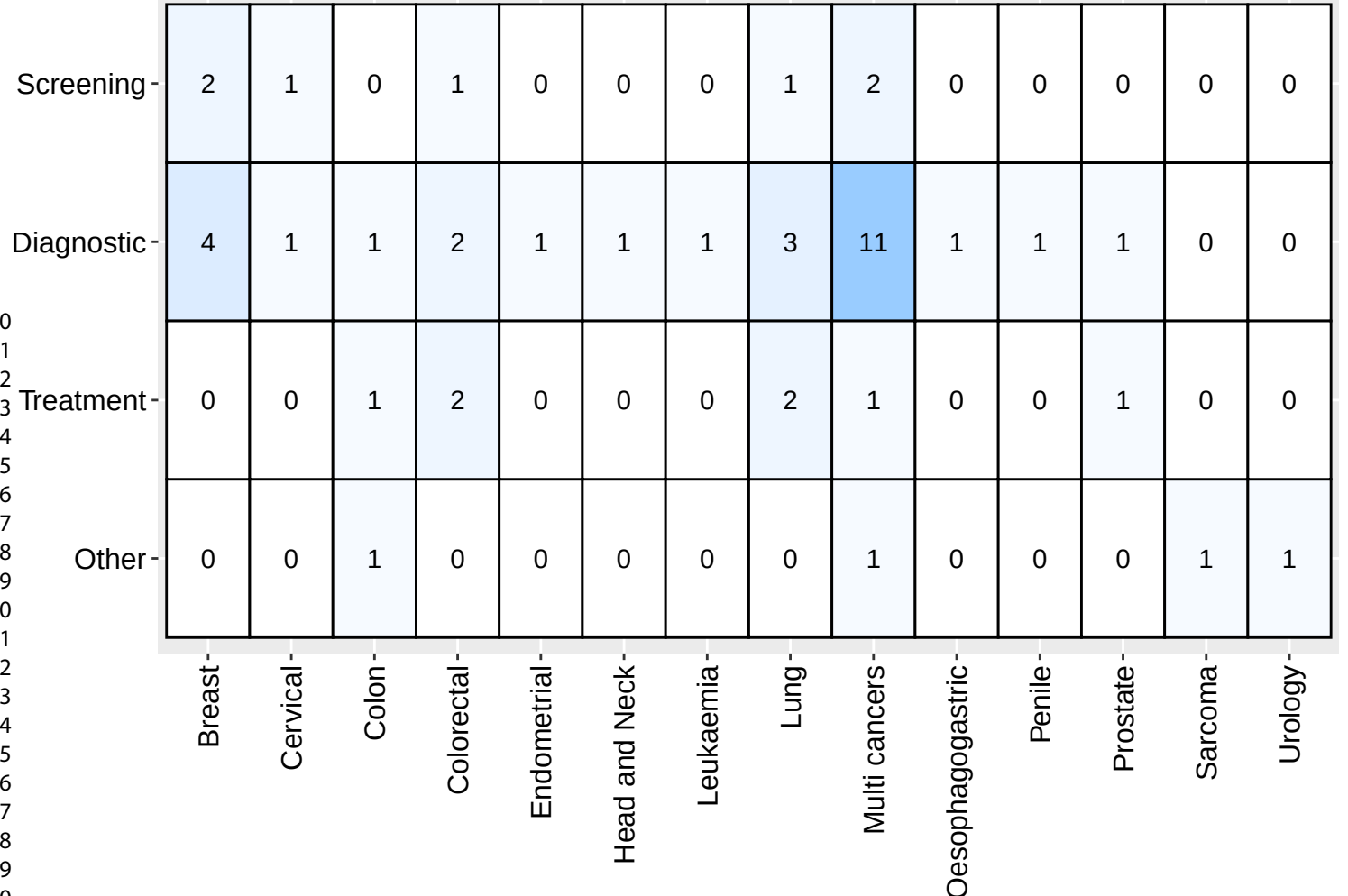
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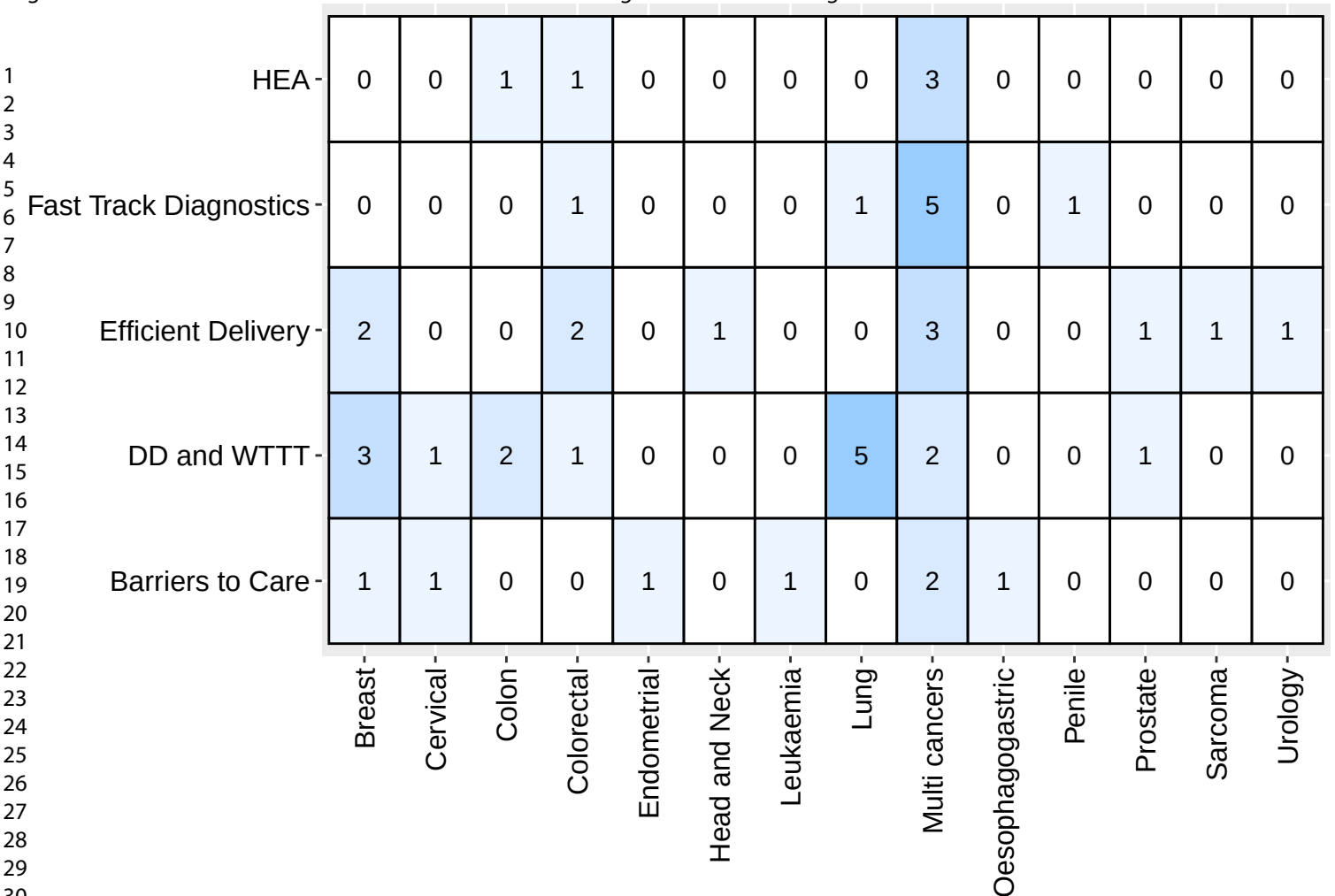
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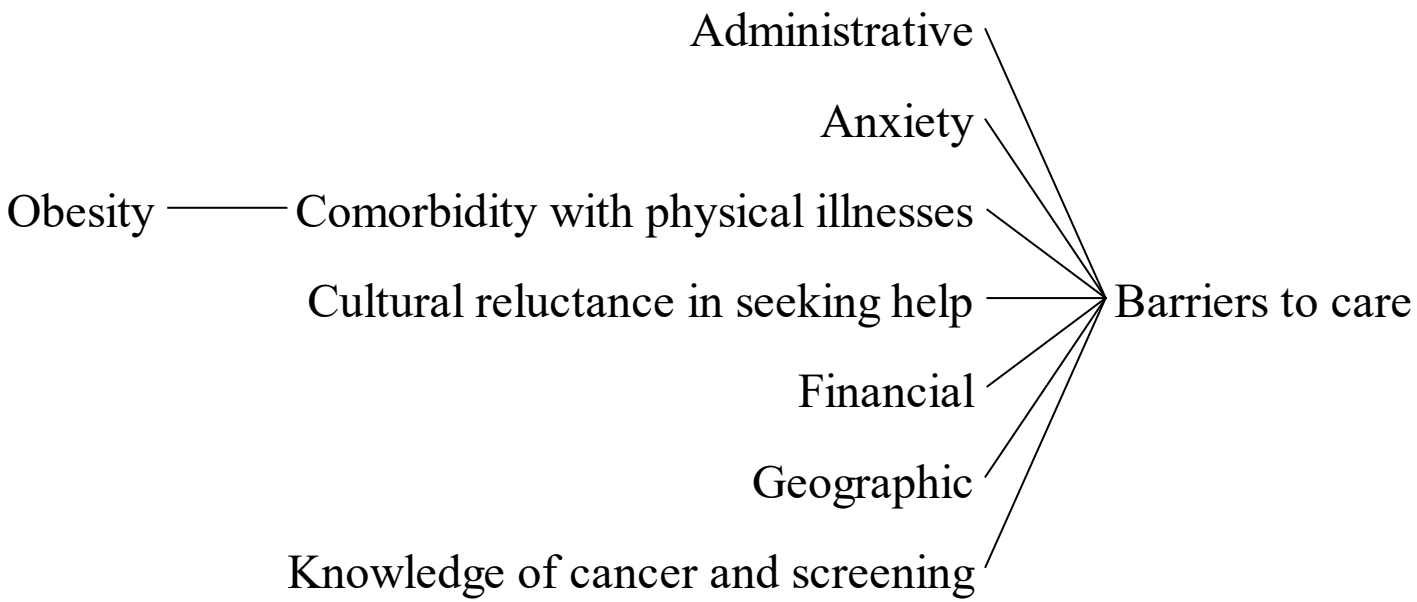
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Cultural reluctance in seeking help
Barriers to care
Financial
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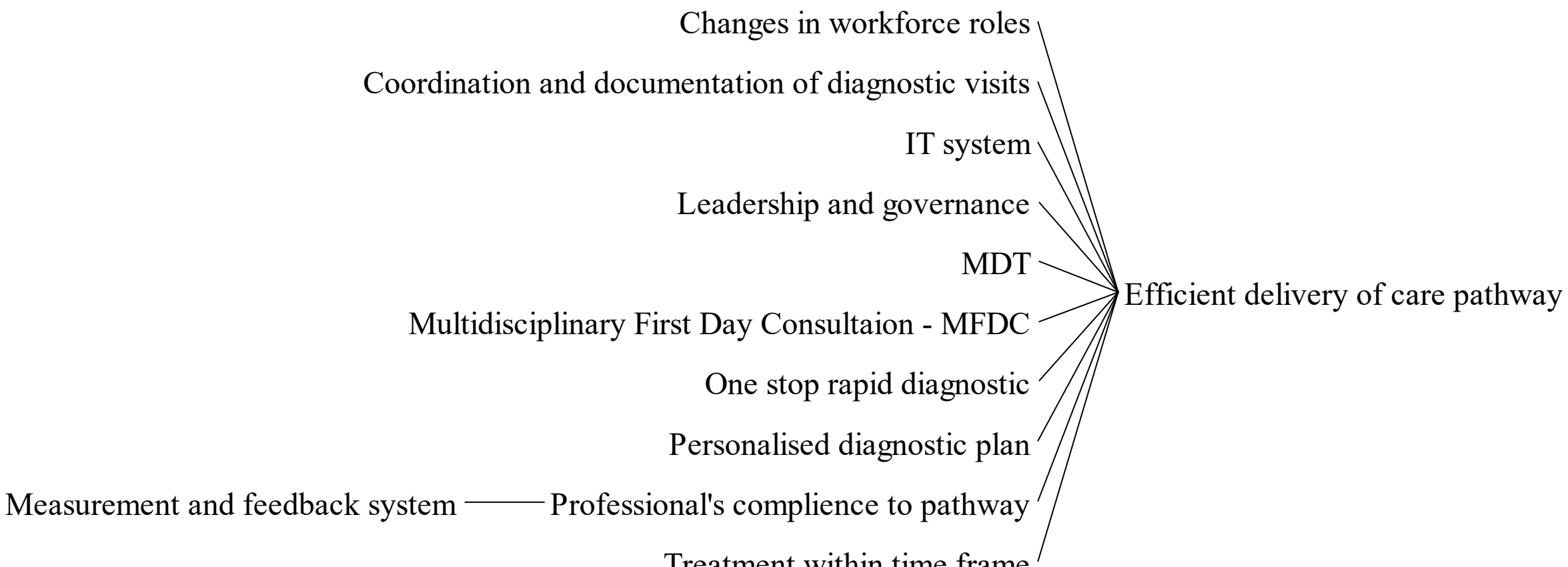
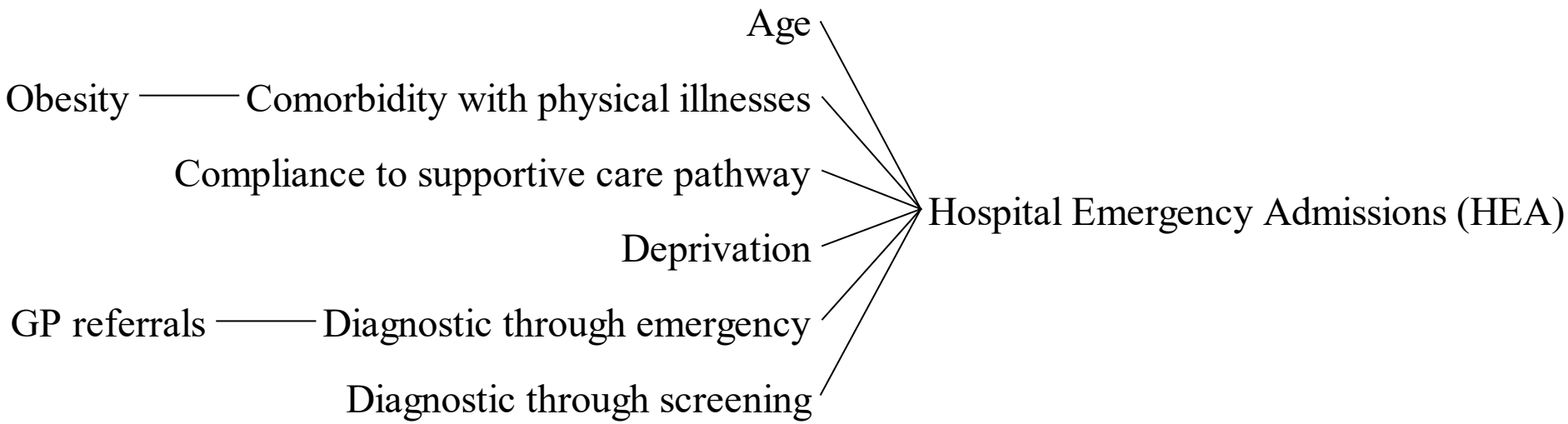
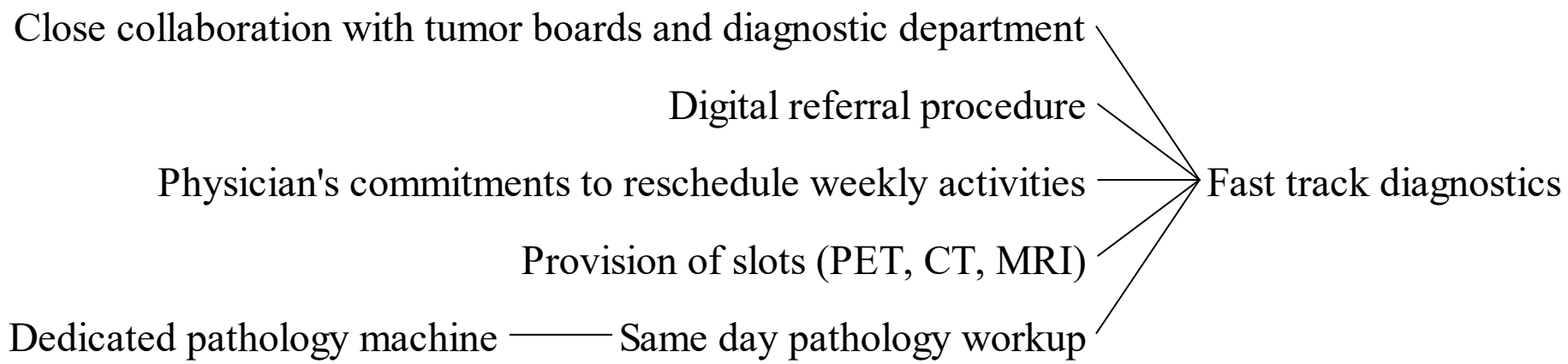
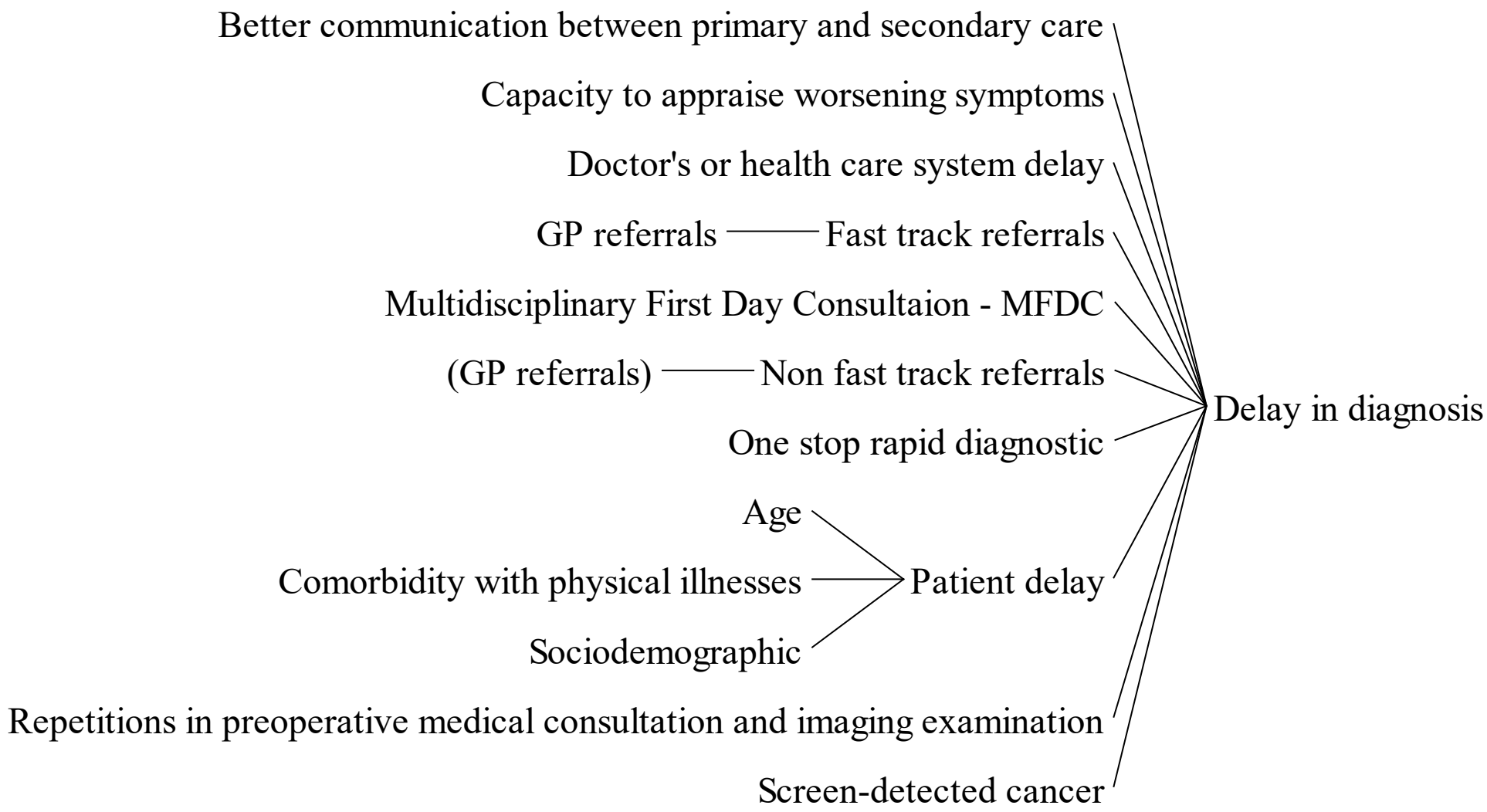
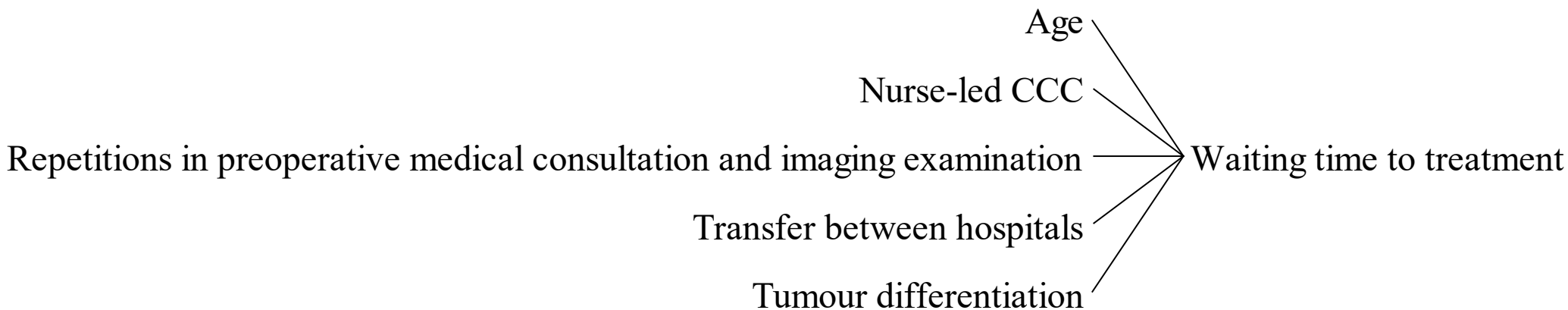
Knowledge of cancer and screening


Changes in workforce roles
Coordination and documentation of diagnostic visits
IT system
Leadership and governance
MDT
Multidisciplinary First Day Consultaion - MFDC
One stop rapid diagnostic
Personalised diagnostic plan
Measurement and feedback system
Professional's complience to pathway
Treatment within time frame
Efficient delivery of care pathway

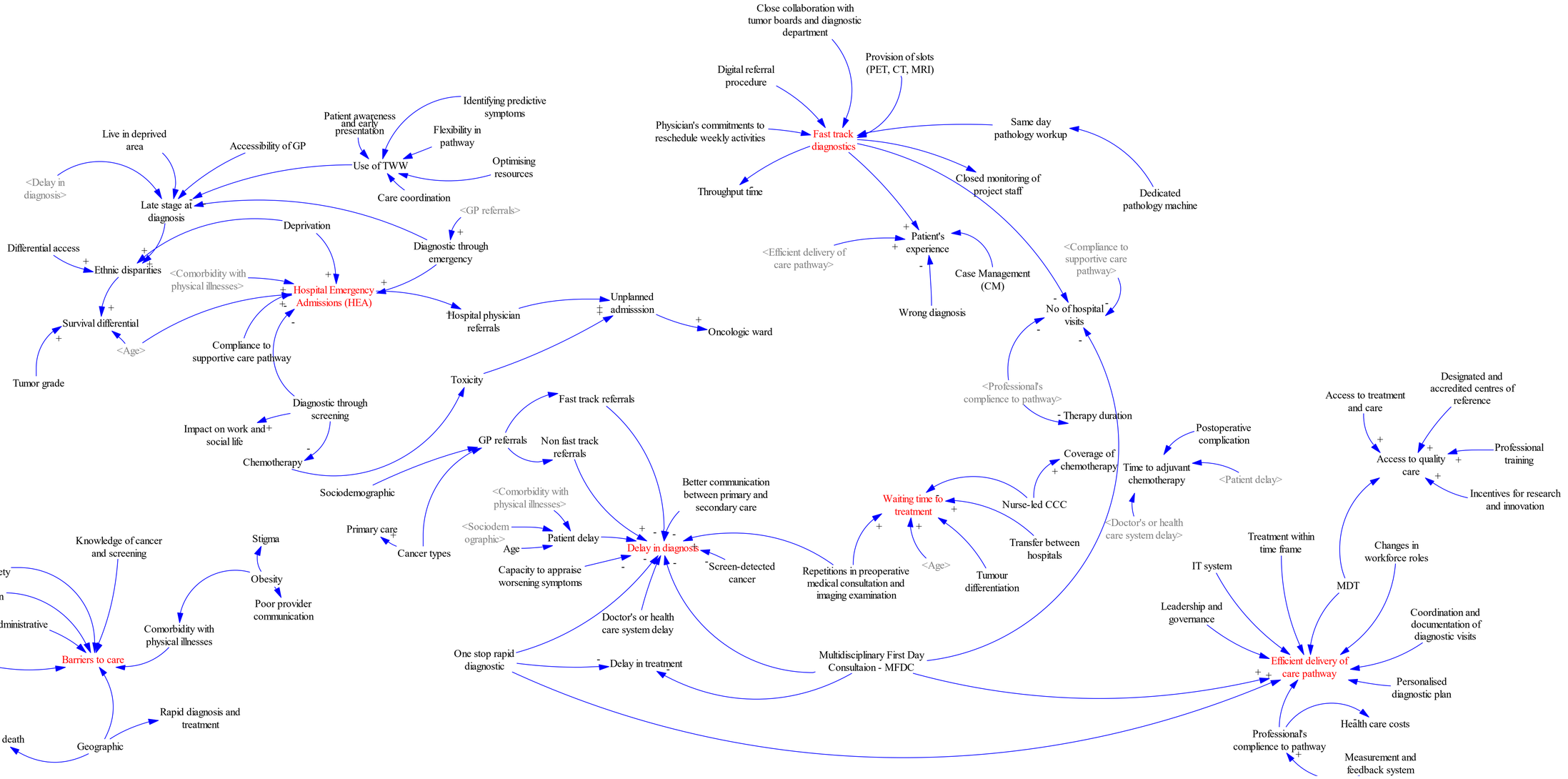

Age
Obesity
Comorbidity with physical illnesses
Compliance to supportive care pathway
Hospital Emergency Admissions (HEA)
Deprivation
GP referrals
Diagnostic through emergency
Diagnostic through screening


Close collaboration with tumor boards and diagnostic department
Digital referral procedure
Physician's commitments to reschedule weekly activities
Provision of slots (PET, CT, MRI)
Dedicated pathology machine
Same day pathology workup
Fast track diagnostics


Better communication between primary and secondary care
Capacity to appraise worsening symptoms
Doctor's or health care system delay
GP referrals
Fast track referrals
Multidisciplinary First Day Consultaion - MFDC
(GP referrals)
Non fast track referrals
One stop rapid diagnostic
Age
Comorbidity with physical illnesses
Sociodemographic
Patient delay
Repetitions in preoperative medical consultation and imaging examination
Screen-detected cancer
Delay in diagnosis


Age
Nurse-led CCC
Repetitions in preoperative medical consultation and imaging examination
Transfer between hospitals
Tumour differentiation
Waiting time to treatment

Appendix A


Live in deprived area
Accessibility of GP
Patient awareness and early presentation
Identifying predictive symptoms
Flexibility in pathway
Optimising resources
Use of TWW
Care coordination
<Delay in diagnosis>
Late stage at diagnosis
Deprivation
<GP referrals>
Diagnostic through emergency
Differential access
Ethnic disparities
<Comorbidity with physical illnesses>
Hospital Emergency Admissions (HEA)
Survival differential
<Age>
Tumor grade
Compliance to supportive care pathway
Diagnostic through screening
Impact on work and social life
Chemotherapy
Hospital physician referrals
Unplanned admisssion
Oncologic ward
Toxicity
Sociodemographic
GP referrals
Fast track referrals
Non fast track referrals
Primary care
Cancer types
<Comorbidity with physical illnesses>
<Sociodemographic>
Patient delay
Age
Capacity to appraise worsening symptoms
Delay in diagnosis
Better communication between primary and secondary care
Screen-detected cancer
Doctor's or health care system delay
One stop rapid diagnostic
Delay in treatment
Multidisciplinary First Day Consultaion - MFDC
Repetitions in preoperative medical consultation and imaging examination
Waiting time to treatment
<Age>
Tumour differentiation
Transfer between hospitals
Nurse-led CCC
Coverage of chemotherapy
<Professional's complience to pathway>
Therapy duration
Time to adjuvant chemotherapy
Postoperative complication
<Patient delay>
<Doctor's or health care system delay>
Close collaboration with tumor boards and diagnostic department
Digital referral procedure
Provision of slots (PET, CT, MRI)
Physician's commitments to reschedule weekly activities
Fast track diagnostics
Same day pathology workup
Throughput time
Closed monitoring of project staff
Dedicated pathology machine
<Efficient delivery of care pathway>
Patient's experience
Case Management (CM)
Wrong diagnosis
<Compliance to supportive care pathway>
No of hospital visits
Knowledge of cancer and screening
Stigma
Anxiety
Obesity
Cultural reluctance in seeking help
Poor provider communication
Administrative
Comorbidity with physical illnesses
Financial
Barriers to care
Early death
Geographic
Rapid diagnosis and treatment
Access to treatment and care
Designated and accredited centres of reference
Professional training
Access to quality care
Incentives for research and innovation
Treatment within time frame
Changes in workforce roles
IT system
MDT
Leadership and governance
Coordination and documentation of diagnostic visits
Efficient delivery of care pathway
Personalised diagnostic plan
Health care costs
Professional's complience to pathway
Measurement and feedback system

Source	Title	Method
Hansen *et al.*, 2008	Socioeconomic patient characteristics predict delay in cancer diagnostis: A Danish cohort study.	Quantitative
Hansen *et al.*, 2011	Time intervals from first symptom to treatment of cancer: A cohort study of 2,212 newly diagnosed cancer patients	Quantitative
Prades *et al.*, 2011	Implementing a cancer fast-track programme between primary and specialised care in Catalonia (Spain): A mixed methods study.	Quantitative & Qualitative
Hoverman *et al.*, 2011	Pathways, outcomes, and costs in colon cancer: retrospective evaluations in two distinct databases.	Quantitative
Wulf *et al.*, 2012	A randomised controlled trial of hospital-based case management to improve colorectal cancer patients' health-related quality of life and evaluations of care	Quantitative

Quan *et al.*, 2012	Improving work-up of the abnormal mammogram through organized assessment: Results from the Ontario Breast Screening Program	Quantitative
Redaniel *et al.*, 2013	Time from diagnosis to surgery and prostate cancer survival: A retrospective cohort study	Quantitative
Tsang *et al.*, 2013	Cancer diagnosed by emergency admission in England: An observational study using the general practice research database	Quantitative
Lamb *et al.*, 2014	Strategies to improve the efficiency and utility of multidisciplinary team meetings in urology cancer care: A survey study	Quantitative
Jensen *et al.*, 2014	Cancer suspicion in general practice, urgent referral and time to diagnosis: A population-based GP survey and registry study	Quantitative
Clarke *et al.*, 2014	'Shouting from the roof tops': A qualitative study of how children with leukaemia are diagnosed in primary care	Qualitative
Kreys *et al.*, 2014	Impact of cancer supportive care pathways compliance on emergency department visits and hospitalizations	Quantitative

Lim *et al*., 2014	Delays in diagnosis of young females with symptomatic cervical cancer in England: An interview-based study	Quantitative
Forrest *et al*., 2014	Factors associated with timeliness of post-primary care referral, diagnosis and treatment for lung cancer: Population-based, data-linkage study	Quantitative
Black *et al*., 2015	Patients' experiences of cancer diagnosis as a result of an emergency presentation: A qualitative study	Qualitative
Wasserman *et al*., 2015	Reasons for delay in time to initiation of adjuvant chemotherapy for colon cancer	Quantitative
Maclean *et al*., 2015	Primary care characteristics and stage of cancer at diagnosis using data from the national cancer registration service, quality outcomes framework and general practice information	Quantitative
Guldbrandt *et el*., 2015	The role of general practice in routes to diagnosis of lung cancer in Denmark: A population-based study of general practice involvement, diagnostic activity and diagnostic intervals 21	Quantitative

Tod *et al*., 2015	Lung cancer treatment rates and the role of the lung cancer nurse specialist: A qualitative study	Qualitative
Redaniel *et al*., 2015	Rapid diagnostic pathways for suspected colorectal cancer: Views of primary and secondary care clinicians on challenges and their potential solutions	Qualitative
Nessim *et al*., 2015	Wait times for breast cancer surgery: Effect of magnetic resonance imaging and preoperative investigations on the diagnostic pathway	Quantitative
Blakely *et al*., 2015	Cancer care coordinators in stage III colon cancer: A cost-utility analysis	Quantitative
Kubal *et el*., 2016	Longitudinal cohort study to determine effectiveness of a novel simulated case and feedback system to improve clinical pathway adherence in breast, lung and GI cancers	Quantitative
Ortiz-Ortiz *et al* ., 2016	Factors associated with late stage at diagnosis among Puerto Rico's government health plan colorectal cancer patients: A cross-sectional study	Quantitative

Haddow *et al.*, 2016	Improving the diagnostic stage of the suspected colorectal cancer pathway: A quality improvement project	Quantitative & Qualitative
Jakobsen and Jensen, 2016	DaPeCa-2: Implementation of fast-track clinical pathways for penile cancer shortens waiting time and accelerates the diagnostic process - A comparative before-and-after study in a tertiary referral centre in Denmark	Quantitative
Huddy *et el.*, 2016	Sequential simulation (SqS) of clinical pathways: A tool for public and patient engagement in point-of-care diagnostics	Qualitative
Turner *et al.*, 2017	A cancer geography paradox? Poorer cancer outcomes with longer travelling times to healthcare facilities despite prompter diagnosis and treatment: A data-linkage study	Quantitative
Héquet *et al.*, 2017	Preoperative clinical pathway of breast cancer patients: Determinants of compliance with EUSOMA quality indicators	Quantitative
Chiarelli *et al.*, 2017	Evaluating wait times from screening to breast cancer diagnosis among women undergoing organised assessment vs usual care	Quantitative

Iachina *et al.*, 2017	Transfer between hospitals as a predictor of delay in diagnosis and treatment of patients with Non-Small Cell Lung Cancer - A register based cohort-study	Quantitative
Momberg *et al.*, 2017	Women's experiences with cervical cancer screening in a colposcopy referral clinic in Cape Town, South Africa: A qualitative analysis	Qualitative
Van Huizen *et al.*, 2018	Multidisciplinary first-day consultation accelerates diagnostic procedures and throughput times of patients in a head-and-neck cancer care pathway, a mixed method study	Quantitative & Qualitative
Bass *et al.*, 2018	Prostate cancer diagnostic pathway: Is a one-stop cognitive MRI targeted biopsy service a realistic goal in everyday practice? A pilot cohort in a tertiary referral centre in the UK	Quantitative
Maringe *et al.*, 2018	Persistent inequalities in unplanned hospitalisation among colon cancer patients across critical phases of their care pathway, England, 2011–13	Quantitative
Cariou *et al.*, 2018	Multidimensional impact of breast cancer screening: Results of the multicenter prospective optisoins01 study	Quantitative

Kasper *et al.*, 2018	Working to improve the management of sarcoma patients across Europe: A policy checklist	Qualitative
Van Harten *et al.*, 2018	Implementing large scale fast track diagnostics in a comprehensive cancer center, pre- and post-measurement data	Quantitative
Tin Tin *et al.*, 2018	Ethnic disparities in breast cancer survival in New Zealand: Which factors contribute?	Quantitative
Zhou *et al.*, 2018	Variation in 'fast-track' referrals for suspected cancer by patient characteristic and cancer diagnosis: Evidence from 670 000 patients with cancers of 35 different sites	Quantitative
Cusimano *et al.*, 2019	Barriers to care for women with low-grade endometrial cancer and morbid obesity: A qualitative study	Qualitative
Aarhus *et al.*, 2019	Coordinating objects of care: Exploring the role of case managers as brokers in cancer patient pathways	Qualitative

Pitter *et al.*, 2019	Planning, implementation and operation of a personalized patient management system for subjects with first suspect of cancer (OnkoNetwork): System description based on a qualitative study	Qualitative
Stokstad *et al.*, 2019	Reasons for prolonged time for diagnostic workup for stage I-II lung cancer and estimated effect of applying an optimized pathway for diagnostic procedures	Quantitative
Sewell *et al.*, 2020	Rapid cancer diagnosis for patients with vague symptoms: a cost-effectiveness study	Quantitative
Laerum *et al.*, 2020	Reduced delays in diagnostic pathways for non-small cell lung cancer after local and National initiatives	Quantitative

DD	Delay in diagnosis
WTTT	Waiting time to treatment
HEA	Hospital emergency admission

Cancer	Service	Theme
Multi cancers	Diagnostic	DD and WTTT
Multi cancers	Diagnostic	DD and WTTT
Multi cancers	Diagnostic	Fast Track Diagnostics
Colorectal	Treatment	Efficient Delivery
Colorectal	Treatment	DD and WTTT

Breast	Diagnostic	Efficient Delivery
Prostate	Treatment	DD and WTTT
Multi cancers	Screening	HEA
Urology	Other	Efficient Delivery
Multi cancers	Diagnostic	Fast Track Diagnostics
Leukaemia	Diagnostic	Barriers to Care
Multi cancers	Treatment	HEA

Cervical	Diagnostic	DD and WTTT
Lung	Treatment	DD and WTTT
Multi cancers	Screening	HEA
Colon	Diagnostic	DD and WTTT
Multi cancers	Diagnostic	Barriers to Care
Lung	Screening	Fast Track Diagnostics

Lung	Treatment	DD and WTTT
Colorectal	Screening	Fast Track Diagnostics
Breast	Diagnostic	DD and WTTT
Colon	Treatment	DD and WTTT
Multi cancers	Other	Efficient Delivery
Colorectal	Diagnostic	HEA

Colorectal	Diagnostic	Efficient Delivery
Penile	Diagnostic	Fast Track Diagnostics
Oesophagogastric	Diagnostic	Barriers to Care
Multi cancers	Diagnostic	Barriers to Care
Breast	Diagnostic	DD and WTTT
Breast	Screening	DD and WTTT

Lung	Diagnostic	DD and WTTT
Cervical	Screening	Barriers to Care
Head and Neck	Diagnostic	Efficient Delivery
Prostate	Diagnostic	Efficient Delivery
Colon	Other	HEA
Breast	Screening	Efficient Delivery

Sarcoma	Other	Efficient Delivery
Multi cancers	Diagnostic	Fast Track Diagnostics
Breast	Diagnostic	Barriers to Care
Multi cancers	Diagnostic	Fast Track Diagnostics
Endometrial	Diagnostic	Barriers to Care
Multi cancers	Diagnostic	Efficient Delivery

Multi cancers	Diagnostic	Efficient Delivery
Lung	Diagnostic	DD and WTTT
Multi cancers	Diagnostic	Fast Track Diagnostics
Lung	Diagnostic	DD and WTTT

Geographical source	Sample size and data source
Aarhus, Denmark	GP questionnaire on patient's diagnostic pathway (2212), Patients questionnaires on socioeconomic characteristics (1252).
Aarhus, Denmark	Population-based cohort of 2,212 patients. Data from administrative registries and questionnaires completed by GP.
Spain	Hospitals' patient records (56020), semistructured interview (83) with health professionals and administrators.
US	Clinical records from an Electronic Health Record database to evaluate survival (910). Claims data from a national administrative claims database to examine direct medical costs (220).
Denmark	A total of 280 colorectal cancer patients, 140 for each group (with CM and usual care).

Ontario, Canada	Clinical records of 25,543 women provided by the Integrated Clinical Management System database. The proportion underwent the work-up through BAA is 39% and through UC is 61%.
England, the UK	Cancer registries from the South West Public Observatory, Hospital Episode Statistics and Office of National Statistics for mortality. Total partisipants 17,043 men.
England, the UK	General Practice Research Database (GPRD), 74763 patients. Integrated Hospital Episode Statistics (HES), . Office for National Statistics (ONS) mortality data.
UK	Health professional involved in MDT across the UK (173 participants).
Denmark	Population size is 3,823. Data is from GP and national register.
England, the UK	Participants: 21 patients and 9 GPs.
USA	4,144 records on therapy from 3,191 patients. Database from the CareFirst claims.

England, the UK	128 female patients aged under 30 years, with a recent diagnosis of cervical cancer in England. Data sources: primary care records and National Cervical Screening Database.
England, the UK	28,733 patient level data obtained from the Northern and Yorlshire Cancer Registry and Information Centre (NYCRIS, 2012)
England, the UK	27 participants.
Canada	Medical records of 580 patients with colon cancer.
England, the UK	Cancer regristry from the National cancer Registration Service, Quality Outcome Framework, GP survey and GP workforce census. Breast cancer: 40,251; Prostate cancer: 34,231; Colorectal cancer: 31,414; lung cancer: 33,027.
Denmak	971 lung cancer incidences from Danish Cancer Registry (DCR) and GP questionnaires.

England, the UK	Purposive sampling. A total of 24 participants took part in interviews; a total of 60 clinical staff attended MDT meetings; a total of 6 LCNSs attented group interviews.
The UK	Purposive sampling of 24 clinicians.
Canada	Retrospective data of 264 women with breast cancer.
New Zealand	New Zealand data on colon cancer incidence, survival, and mortality.
Florida, USA	48 providers at Moffitt Cancer Center (MCC)
Puerto Rico	A total of 190 colorectal cancer patients from Puerto Rico Central Cancer Registry (PRCCR) and the PRHIA databases.

The UK	30 patients for interview and 29 individuals for workshop.
Denmark	263 patient records from medical records and administrative systems.
England, the UK	38 participants.
Scotland, the UK	12,339 patients. Database was provided by the Health Authority (NHS Grampian) Cancer Care Pathway (CCPd).
France	604 patients. Data from operable breast cancer patients recorded in participating hospitals.
Ontario, Canada	9044 patient records from Ontario Breast Screening Program (OBSP).

Denmark	11,273 patient records provided by the Danish Lung Cancer Registry (DLCR).
Cape Town, South Africa	27 women who were first time colposcopy clinic attendees at a tertiary hospital colposcopy clinic.
Netherlands	89 patient records retrieved from medical records.
The UK	112 male patients identified through referral at prostate cancer one stop clinic.
England, the UK	65,020 records patients with colon cancer, linked with the Hoapital Episode Statistics (HES) in-patients and A&E datasets.
France	379 patients aged between 50 and 74 years identified from screening records.

Europe	NA
Netherlands	175 patient records from cancer centre.
New Zealand	13,657 patient records provided by Auckland and Waikato Breast Cancer Registers. The registers were linked to National Cancer Registry, Mortality Collection, and the National Minimum Dataset.
England, the UK	66,9220 patients provided by the national Cancer Data Repository (NCDR).
Toronto, Canada	15 patients with endometrial cancer.
Denmark	13 patients and 26 healthcare professionals

Hungary	20 interviews with representatives of key stakeholder including: 1 programme manager, 2 programme initiators, 1 financial expert, 4 physicians, 8 non-physician health care profesionals, 2 patients, and 2 informal caregivers.
Norway	100 patient records from hospital database.
The UK	1000 patients were simulated using real data from Neath Port Talbot Hospital (NPTH) Rapid Diagnostic Centre.
Norway	780 patient records from hospital database.

Purpose
To examines whether patients' socioeconomic characteristics are predictors of long patient-, doctor- and system-related delay in cancer diagnosis.
To explore patient-, general practitioner (GP)- and system-related delay in the interval from first cancer symptom to diagnosis and treatment, and to analyse the extent to which delays differ by cancer type.
To analyse the implementation and overall effectiveness of cancer fast-track programme.
To evaluate the clinical outcomes and the economic impact of adherence to level I Pathways, an evidence-based oncology treatment program in the treatment of colon cancer.
To analyse the effectiveness of hospital-based case management (CM) in terms of patient-reported outcomes.

To evaluate outcomes of women undergoing work-up after abnormal mammogram through a formal breast assessment affiliate (BAA) program with explicit cate pathways compared with usual care (UC) using developed quality indicators for screening mammography programs.
To investigate the association between waiting time, from diagnosis to surgery, and the patient's survival.
To determine the incidence of first-ever diagnoses of cancer by emergency (unplanned) admission and identify patient-level risk factors for these diagnoses in England.
To evaluate the implementation of MDT, and identify interventions and strategies to improve the efficiency and productivity of the MDT meeting.
To analyse the association between the cancer suspicion by GP and the time to diagnosis, and between the choice of using cancer patient pathways and the time to diagnosis.
To investigat the prehospital presentation of paediatric leukaemia and identify the disease and non-disease realted factors which facilitate or impede diagnosis.
To evaluate the effects of pathway compliance to supportive care agents on ED visits and hospitalizations attributed to chemotherapy-induced adverse effect.

To examine the extent and determinants of delays in diagnosis of young females with symptomatic cervical cancer.
To investigate the factors influencing timely post-primary care referral, diagnosis and treatment for lung cancer.
To understand how the emergency presentation arise of patients who received cancer diagnosis following the ED visit.
To examine factors associated with delay in time to adjuvant chemotherapy.
To investigate association of primary care characteristics and stage of cancer at diagnostic phase.
To describe the routes to cancer diagnosis, the diagnosis activity preceding diagnosis and the diagnosis intervals for lung cancer.

To examine the role of Lung Cancer Nurse Specialist (LCNS) in care pathways.
To ascertain the challenges associated with implementation of the 2-week wait referral criteria and waiting tine targets for colorectal cancer and to identify recommendations for improvements to the pathway.
To determine the overall wait time and identify factors associated to overall wait time from identification of an imaging abnormality to definitive treatment in women with breast cancer.
To evaluate the effectiveness of cancer care coordination for stage III colon cancer patients.
To examine whether a measurement and feedback system led to improvements in adherence in clinical pathways.
To evaluate factors associated to colorectal cancer stage at diagnosis including delay in diagnosis.

To improve the lead-time and the patient experience of the diagnostic stage of the suspected colorectal cancer pathway.
To examine the feasibility and impact of a fast-track referral pathway on clinical time intervals from the first symptom of penile cancer to first treatment.
To introduce the sequential simulation as a methodology to active public and patient engagement in developing point-of-care tests.
To investigate the impact of burden of travel on the cancer diagnostis process.
To describe the preoperative clinical pathway of breast cancer patients and evaluate the determinants of compliance with the European Sociaety of Breast Cancer Specialists (EUSOMA) quality indicators.
To evaluate factors associated with waiting time from screening to diagnosis for women undergoing assessment through Breast Assessment Centre (BAC) and Usual Care (UC).

To find out the influence of transfer between hospitals on waiting time to the diagnosis and treatment for lung cancer.
To explore the explore and understand women's experience with cervical cancer screening and referral pathways.
To evaluate the effects of implementing the multidisciplinary first day consultation (MFDC) on efficiency of the care pathway, measured as process indicators throughput times (referral, diagnostic, procedures and start treatment) and number of hospital visits.
To demonstrate the feasibility of a 'one stop', rapid diagnostic prostate cancer pathway, using both multiparametric MRI and transperineal targeted biopsy.
To examine the occurance of hospital emergency admissions among colon cancer patients on three time periods: 90 days pre-diagnosis, 90 days post diagnosis and 90 days pre-death.
To evaluate the impact of breast cancer screening on therapeutic management, costs, patients' needs, and working life.

To highlight key gaps in research, policy, practice, and initiatives that may impact the future care of sarcoma patients in different European countries.
To report the process of analysis, redesign, implementation, organisational dynamics and first results using a pre and post measurement design.
To identify factors associated to cancer survival within different ethnicities.
To eximine factors influencing GP's decision to refer cancer patients through either a fast-track or an elective GP referral.
To understand the experiences of low-grade endometrial cancer patients with morbid obesity, from onset to diagnosis to surgery.
To explore how care managers (CM) handle their various responsibilitites and focuses on the micro-politics of case management.

To provide a quality evaluation of OnkoNetwork along the components of SELFIE conceptual framework: service delivery, leadership and governance, workforce, financing, technologies and medical products, and information and research.
To identify reasons for delays and estimate the effect on timeliness when applying on optimal dianostic pathway.
To explore the cost-effectiveness of the Rapid Diagnostic Centre in its first year of operation compared with standard clinical practice.
To analyse the impact of intervention in cancer pathways at local and national level to the time to treatment.

Results
Patient delay: retired female experienced shorter delays than employed female patients. Female smokers experienced longer delays than female non-smokers. *Doctor delay*: female with economic advantage experienced shorter delays than those female with economic disadvantage. Well-educated males experienced shorter delays than men with short education. Male patients experienced longer doctor delays than women. *System delay*: female patients with economic advantage experienced shorter delays than women with economic disadvantage. Female with high alcohol intake experienced longer delays that women with average intake.
Patient delay (median 21 days) and system delay (median 55 days) constituted of most total delay (median 98 days). Different cancer types have different median total delays.
Using the fast-track programme, half of patients with colorectal, lung and breast cancers are diagnosed within 30 days. The fast-track programme contibuted to clarifying and accelerating cancer diagnosis and treatment.
Adherence to pathways associated to lower costs of treatment, shorter duration of therapy, and lower rate of hospital admission related to chemotherapy.
There is no evidence to support that CM improve health-related quality of life. However, patients with CM reported more positive care experience compared with those without CM.

With respect to timeliness, patients requiring a core or surgical biopsy were more likely to be diagnosed within 7 weeks through a BAA compared with those underwent UC.
Factors associated with longer waiting time to surgery after diagnosis include patient's age, geographical location of patient's residence and the tumor differentiation.
Around 13.9% patients diagnosed with cancer for the first time were diagnosed via emergency admission. Patients of older age or living in the most deprived area were most at risk of diagnosis by emergency admission. Patients with multiple number of visits prior the diagnosis were less likely to be diagnosed by the emergency route.
The efficiency and effectiveness of MDT can be improved by prioritising cases based on complexity, tumor type, or the availability of the MDT member.
Patients with 'alarm' symptoms were more likely to be reffered to the cancer patient pathways, and shorter waiting time to diagnosis.
The nature of parent-doctor relationship associated with access to diagnosis pathway. Factors associated with delay in diagnosis included lack of continuity of GP; some GP's reluctance to take blood from children; and some parents feeling unable to voice effectively their concerns.
Only G-CSF pathway compliance showed significant association with decrease in the rate of neutropenia ED visits/hospitalizations. G-CSF stands for granulocyte colony-stimulating factors.

Patient awareness of cancer symptom contributed to delay in diagnosis.
Factors associated with timely post-primary care referral, diagnosis and treatment include cancer stage, permormance status, and cancer histology.
Delay in receiving diagnosis may caused by repeaded cycles of help-seeking and appraisal. In some cases, system failure due to clinical decisions that were not consistent with the guideline or a break down in the pathway to diagnosis.
The significant factors associated with delay in receiving adjuvant chemotherapy were the presence of a postoperative complication or intercurrent illness and oncologist- or patient-initiated delay.
Patient characteristics such as ethnicity, age, and living in deprived areas could act as confounders for presenting with advanced female breast cancer. Whereas age and gender were important cofounders for presenting with advance lung cancer. Men living in deprived areas were morelikely to present at advanced stage for prostate cancer. GP characteristics such as location, easy access, higher use of TWW and detection rate can relate to cancer presentation stage for a centain cancer types.
The majority of lung cancer patients received diganosis referrals through GP with some cases undegone the fast-track pathways. GP's symptom interpretation and the use of fast-track route were significantly associated with different diagnostic interval. Patients' education level and age were found significantly associated with longer primary and diagnostic intervals.

LCNS plays important role within the multidisciplinary team (MDT) and can act as a catalyst to patient access to treatment. The role involved assessment, managing symptoms, psychological support and information provision.
The study identified challenges in implementing the 2-week referral system. These include patient delay in seeking GP advice and the wait for GP appointment; difficulty in applying the referral guidelines due to vague symptoms and commorbidities.
Factors associated with prolonged wait times included number of operative clinic visits, number of visits to radiology, and initial imaging outside of the centre. Independent factors associated with a decreased wait time include the disease severity, previous history of breast cancer, positive family history, presentation with mass, first imaging abnormality seen on ultrasound.
The nurse cancer care coordinators showed cost-effective if coupled with increase treatment coverage and reduce time to treatment.
The study found that measurement and feedback programme significantly improved the adherence to clinical pathways particularly in work up and cancer treatment.
The logistic regression model estimated that factors associated with late stage cancer to be a diagnostic delay of 60 days or more and having the first contact for a cancer diagnosis through hospital emergency.

The reduction in lead time from referral to diagnosis was achieved by implementing new pathway which include features such as same-day referral triage, implementing straigh-to-test as default triage outcome, reviewing benign disease in a virtual clinic and discharging patients by letter and telephone, coupling the secondary imaging with endoscopy slots, and coupling the MDT with same day cinic appointments.
The implementation of Cancer Patient Pathway significantly reduced the system interval. The reduction was achieved through prebooking of outpatient clinic appointments and upfront referrals of all diagnostic procedures. It is also supported by the cancer coordinator.
With respect to diagnostic strategy, the study found key themes. These are lack of awareness of oesophagogastric cancer, the existance of barriers to testing and diagnosis, the need for designing new test device, new clinical pathway, and placement for test device such as at a GP or a pharmacy.
The study found that patients (who develop common cancers) with increased burden of travel to key healthcare components (GP practice, cancer diagnosis centre and cancer treatment centre) received quicker diagnosis and primary treatment.
Having multiple examinations within the centre was found associated with an increased waiting time to surgery. Whereas having an outpatient breast biopsy was found reducing the waiting time to surgery.
Factors associated with the shorter wait time to diagnosis include having more procedures per visit, procedures scheduled in shorter intervals, and imaging or biopsy on their first visit.

Patients with transfers between hospitals experienced longer waiting time in receiving treatment from the point of finishing the primary investigation. This also means longer waiting time from referral to receiving treatment.
Factors associated with access barrier to cancer care include negative community opinions relating to having the test and low encouragement from peers. Factors related to health care providers include lack of information regarding referral and the quality of information provided.
The implementation of MFDC significantly reduced the thoughput time in the diagnosis and start treatment. However, implementation of new treatment modalities did not show the same effect. This was because complex treatment needs more time and more hospital visits.
Implementing the interventions offered in the study (mpMRI was performed prior to patients attending clinic, on the same day; results were available within 48 hours and discussed at a specialist MDT meeting; patients returned for councelling within 7 days) reduced the time to diagnosis and treatment.
Patients with colon cancer experienced HEA in all three 90 days periods, pre-diagnosis, post-diagnosis, and pre-death. In 90 days pre-diagnosis, over a third of patients experienced at least one HEA; female patients and those with advanced stage of cancer experienced more HEAs than their counterparts. Deprivation and tumor stage (I-III) were found related to proportion of HEA in all periods.
Breast screening found higher proportion patients with earlier and less aggressive tumor. This lead to a reduced number of chemotherapies. Direct medical costs accosiated with patients with screening was less than those without screening.

Key areas that support the access to quality cancer care are the need for development and designated and accredited centres of reference; more professional training; multidisciplinary care; greater insentive to research and innovation; and more rapid access to effective treatments.
Implementation of fast-track diagnostics reduced the access and throughput time to diagnosis. In some cases the implementation was supported by one-stop-shop design, enabling one day pathology workup. Other factors involved the close collaboration between the tumor board and diagnostic department.
Maori and Pacific women had higher risk of excess mortality from breast cancer. Factors associated with this different risk include late stage at diagnosis, neighbourhood deprivation, mode of diagnosis, type of health care facility where primary cancer treatment was undertaken and type of loco-regional therapy.
Factors influencing variation in proportion of fast-track referral include cancer site, age, sex, and deprivation.
Factors associated with barrier to care include administrative, geographic and financial challenges. Other factors may related to patients' and providers' lack of knowledge on endometrial cancer and its symproms and poor communication.
The case managers' role encompasses caring for the patients with respect to their illness, their experience in receiving the care, the organisation, and the cancer patient pathways.

The study provided comprehensive report in all evaluated areas. Within the service delivery, elements supported the care delivery include: 1. patient enrolment to receive priority in care, persolanised care epathway, and timely access to quality care. 2. Personalised diagnostic plans that comform with the diagnostic protocols. 3. Coordination and documentation of diagnostic visits. 4. A multidisciplinary Tumor Board whose responsible in providing multidisciplinary persolanised diagnostic and treatment plans. 5. Treatment and follow up which be provided within the time limit.
Factors infleuncing delay in receiving first treatment include (among others) late referral to a PET CT and for an exercise test at the first hospital visit, multiple procedures in diagnostic workup, delay in making decision at tumor board meeting due to incomplete results. Based on the finding, the optimal pathway was developed which focuses on reducing times from referral to star treatment.
The simulation model showed that referring patients with vague symptoms to Rapid Diagnostic Centre can be most cost effective and reduce time to diagnosis.
Factors associated with longer time to treatment include the severity of the cancer (stage I-III), use of PET-CT for staging, dianostic procedure at external hospital, and number of diagnostic precedures.