Essential TNM: a registry tool to reduce gaps in cancer staging information

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Accurate information on the extent of disease around the time of diagnosis is an important component of cancer care, in defining disease prognosis, and evaluating national and international cancer control policies. However, the collection of stage data by population-based cancer registries remains a challenge in both high-income and low and middle-income countries. We emphasise the lack of availability and comparability of staging information in many population-based cancer registries and propose Essential TNM, a simplified staging system for cancer registries when information on full Tumour, Node, Metastasis (TNM) is absent. Essential TNM aims at staging cancer in its most advanced disease form by summarising the extent of disease in the order of distant metastasis (M), regional lymph node involvement (N), and tumour size or extension, or both (T). Flowcharts and rules have been developed for coding these elements in breast, cervix, prostate, and colon cancers, and combining them into stage groups (I–IV) that correspond to those obtained by full TNM staging. Essential TNM is comparable to the Union for International Cancer Control TNM stage groups and is an alternative to providing staging information by the population-based cancer registries that complies with the objectives of the Global Initiative for Cancer Registry Development.

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Introduction

Disease stage at diagnosis for patients with cancer—ie, the anatomical extent of the disease at the time of diagnosis—is a crucial component of clinical patient care, which helps guide the selection of appropriate treatments, and provides the likely prognosis of individual patients on the basis of the average survival of a comparable group of people who have a similar extent of disease.[1] Stage also has an important public health dimension in that it describes the overall disease burden, guides cancer control planning activities, and helps evaluate outcomes of the health-care system, such as early detection or patient management programmes.[2,3] Although patients residing in rural or remote areas, and those with socioeconomic disadvantages, are more likely to be diagnosed with cancer at a late stage,[4–6] an increasing proportion of early-stage cancers has been reported following implementation of specific cancer control measures for amenable cancers such as colorectal cancer, breast cancer, and ovarian cancer, among others.[7–9] The surveillance of new cancer cases by stage has supported decisions for the introduction of population-based screening programmes, such as colorectal cancer in Ireland,[10] and has also been used to monitor the effects of decisions not to screen, such as for prostate cancer in the USA.[11] Cancer survival by stage is a powerful measure to assess the overall effectiveness of a health-care system and a cancer control programme. Increased awareness and knowledge of symptoms among the population, and implementation of specific measures, should result in diagnosis of cancer at a less advanced stage.[12] The stage at diagnosis is optimal information when measured at the population level (rather than single institutions, or a clinical series). Population-based cancer registries (PBCRs) are one source of stage data that can provide these essential data at the population level.

Despite the importance of information about cancer incidence by stage in public health, such data is often unavailable, or incomplete, because of the complexities of cancer staging and the difficulties of PBCRs in collecting these data from medical records. To overcome these barriers, simplified staging systems, such as SEER Summary Stage[13] and Condensed TNM,[14] have been developed. These systems have been successful in some settings but have not been adopted universally and are not necessarily comparable with the classification of cancer that is used in clinical practice, such as the Union for International Cancer Control (UICC) TNM staging system.[1] The main uses and classifications of stage information in clinical and public health are summarised in the panel and emphasise the need to integrate the two perspectives. There is a need to use one common language between clinicians, researchers, and public health specialists, which would imply the use of one single staging classification by all actors improving the comparability across different settings.

This Review describes the Essential TNM staging system, in which a simplified Tumour, Node, Metastasis (TNM) staging system can be used by cancer registries when full TNM information is not directly documented in the medical record, or resources are not available to support the training and collection of the detailed data required. First, we briefly introduce the TNM classification and describe the key problems encountered by PBCRs in capturing information on cancer stage. Second, we explain the logic, structure, and components of Essential TNM, and include a guide to its use in cancer registries (appendix pp 1–8). The use of Essential TNM (when complete TNM is missing) by cancer registrars is expected to improve the availability of stage information at the population level, in a manner that is comparable with TNM.

See Online for appendix

***Panel:* Uses and classifications of cancer stage information**

Clinical setting

Uses of cancer staging information

- Treatment planning
- Indication of prognosis
- Evaluation of treatment
- Research

Main cancer stage classifications

- Tumour, Node, Metastasis (TNM)
- International Federation of Gynecology and Obstetrics
- Ann Arbor or Lugano classification
- Dukes classification

Public health setting

Uses of cancer staging information

- Description of burden by stage
- Survival analysis
- Evaluation of early detection and screening programmes
- Research

Main cancer stage classifications

- TNM
- SEER Summary Stage
- Condensed TNM
- Toronto guidelines for cancers in children

Cancer staging in the clinical setting

Stage at diagnosis, together with the primary site and histology of the tumour, provide critical information to establish the diagnosis and prognosis of an individual patient and to plan initial cancer treatment. Even with the increasing availability of molecular markers in oncology, anatomical extent of disease remains a key determinant of clinical outcome for any given patient.[1]

As with other diseases, classification systems are necessary to standardise the way in which disease data are captured in an effort to facilitate comparability over time and across institutions, medical groups and researchers. The most frequently used classification for recording the extent of cancer is the tumour (size), node (lymph node), metastasis classification system.[1] This classification, initially developed between 1943 and 1952, has benefited since its inception from the involvement of the UICC in collaboration with the American Joint Commission on Cancer (AJCC), who have been responsible for the scientific work required for periodic updates to the cancer site-specific definitions of disease extension and for the subsequent dissemination of staging information to interested users. The latest edition (the 8th edition) of UICC TNM was published in 2017.[1]

The underlying premise of cancer staging is to provide a baseline description of the anatomical extent of disease before any therapeutic intervention is offered.[15] Clinical stage describes the extent of disease at the time of diagnosis and is based on patient history, physical examination, diagnostic biopsies, and any imaging done before the initiation of treatment. When patients undergo surgery as a treatment option, a separate pathological stage (based on post-surgery histological examinations) can be assigned in addition to clinical stage. Both clinical and pathological stage involve describing the extent of the primary tumour (T category), involvement of regional lymph nodes (N category), and spread (or metastasis) to distant sites (M category) at the different time- points described above. Once captured, the T, N, and M categories can then be combined into Stage groups I, II, III, and IV. Typically, stage I tumours are confined to the organ of origin, and stage IV tumours have distant metastatic disease.[1] Importantly, TNM staging applies predominantly to epithelial and other solid tumours and is not used in haematological malignancies or tumours such as those of the central nervous system, for which size and extent of disease have little or no prognostic value. As data for TNM are derived from a variety of sources, the final TNM classification or stage grouping rests with the professional who has access to the most complete data and defines the patient management scheme.[16]

Together, the UICC and AJCC TNM classifications,[1,17] which are nearly identical, are the most comprehensive staging systems used in the clinical setting globally. Other classification systems exist but they are typically limited to specific cancers. For example, the International Federation of Gynecology and Obstetrics (FIGO) stage classification used for gynaecological tumours (cervix, endometrium, fallopian tubes, ovary, and vulva)[18,19] has been approved by both UICC and AJCC for use in these cancers. For Hodgkin lymphoma and non-Hodgkin lymphoma, the most widely used classification has been the Ann Arbor classification of 1971, which was modified into the Lugano classification used by the UICC.[1,20,21] Dukes' classification was developed to stage colorectal cancer,[22] and, although now considered obsolete, is still used in some clinical settings.

Staging in population-based cancer registries

In the public health setting, stage at diagnosis of a cancer is closely related to the level of awareness and knowledge of the population, to the accessibility to diagnostic and health-care services, and to the existence and quality of the health-care facilities. Furthermore, stage is a necessary variable when interpreting cancer survival both at the hospital level and the population level.[2]

As with other data items captured in PBCRs, stage must be abstracted from medical records by cancer registrars, which is a process that entails various challenges. Although clinicians have the responsibility to assign the stage of the patients they are treating, many might fail to explicitly document the stage—or its constituent information—in the patient's medical records. As a result, registrars must decipher the details from the records themselves. To specify the extent of disease according to the TNM system, basic knowledge

of the anatomy of the affected organ, its associated lymph node drainage, and common sites of metastasis are usually required. To further complicate matters, these factors are different for each cancer site. For cancer registrars, who in many cases are not health professionals and often have not undertaken the appropriate training, interpreting and abstracting this complex information from the medical records across many different cancer sites is challenging, and is one of the leading factors that contributes to incomplete information on TNM stage in PBCRs.

This limitation, though more striking among PBCRs in low-income and middle-income countries, is not exclusively limited to such settings, and incomplete staging information is an issue whether data are abstracted manually or via an electronically linked system.[23,24] Missing TNM staging information is more frequent among older patients and those with more comorbidities, and often varies with cancer type.[25,26] Conversely, factors associated with more complete staging documentation in health-care facilities include being treated at a university hospital,[27] or because of quality oncology care initiatives or accreditation processes.[28,29]

The Toronto guidelines have been elaborated and validated in Australia to facilitate the collection of cancer stage of paediatric tumours, though they are yet to be implemented worldwide.[1,30,31]

Staging systems for PBCRs

Because of the difficulties involved in abstracting stage for PBCRs and recognising the importance of this information, other simplified staging systems have been developed especially for cancer registries. The two most widely used are the SEER Summary Stage and the European Network of Cancer Registries (ENCR) Condensed TNM staging systems.

Summary Stage was first developed by the National Cancer Institute's End Results Group in the 1950s, with the most recent update occurring in 2018.[13,32] The Summary Stage applies to all anatomical cancer sites including leukaemia, combines both clinical and pathological information available on the extent of disease from the medical record, and has cancer site-specific coding rules developed specifically for registrars that group cancers into five main categories (in situ, localised, regional, distant, and unknown). Although Summary Stage has the advantage of not changing with each TNM edition, and is quite simple to learn and use (in the USA, for example, it attains a completeness of up to 90% for breast and cervical cancer[33,34]), it is not exactly comparable with TNM stage groups, and the system is seldom used or understood outside of the cancer registry world.

Condensed TNM is a simplified TNM system recommended by ENCR in 2002 that attempts to derive a stage when T, N, or M, or all three of these, have not explicitly been recorded in the clinical or pathological records.[14] In condensed TNM, T can be classified as either advanced (A) or localised (L) disease, for which there is a corresponding list of conventional values by cancer site. The N category is coded N+ when there is spread to regional lymph nodes, or categorised as N– when there is no regional spread. However, the ENCR guidelines make a distinction between resectable and unresectable cancers, a largely subjective interpretation depending on the skills of surgeons. Condensed TNM has not been widely adopted by European registries, who more frequently use TNM over the condensed TNM staging system.[35]

Staging in the context of global cancer surveillance

Even within the international cancer registry community, many of whom are members of the International Association of Cancer Registries (IACR); or in the context of regional registry networks, such as the European Network of Cancer Registries, the adoption and use of staging systems are not homogeneous between many regions, registries, and countries,[35,36] with many PBCRs not even attempting to capture stage. Comparability between, and often within, countries is therefore difficult and is a concern for geographical and temporal comparisons in estimating cancer incidence by stage, as well as for benchmarking studies.[37]

A broad overview of the availability of staging data at a global level can be derived from the information provided by registries submitting incidence data to the quinquennial International Agency for Research on Cancer (IARC) publication, Cancer Incidence in Five Continents (CI5). According to the CI5 questionnaire, in which registries submitting incidence data were asked whether they collect stage data, the proportion of registries claiming to record stage information for "all sites" and "some sites" combined was 85·2% and 62·5% in the X and XI volumes, respectively.[38,39] The observed decrease is mainly driven by the number of new registries submitting incidence data, which increased from 370 to 483 between volumes, with many recently established registries (eg, those in Asia, where registries submitting data doubled from 80 to 164) apparently not collecting stage data. Nonetheless, caution is needed when interpreting this information as the CI5 questionnaire might reflect the aspiration to collect stage data rather than the reality.

Comparability and completeness of staging information

The variety of staging systems used by cancer registries and variation in completeness of recording stage makes comparisons of results difficult, particularly in international benchmarking studies. Walters and colleagues[37] concluded that research would be facilitated if all clinicians and registries adhered to a common staging system, such as TNM, which should remain simple enough for epidemiological research.

	TNM stage distribution (%)*				Missing
	I	II	III	IV	
Breast					
Victoria, Australia (2010)†	44	25	20	4	8
Chennai, India (2009)†	1	19	21	7	52
Izmir, Turkey (2006–12)	NA	NA	NA	NA	NA
Harare, Zimbabwe (2006–12)	0	5	21	5	71
Cervix					
Victoria, Australia (2010)	NA	NA	NA	NA	NA
Chennai, India (2009)†	4	31	27	5	32
Izmir, Turkey (2006–12)	NA	NA	NA	NA	NA
Harare, Zimbabwe (2006–12)	2	14	52	8	26
Colorectal					
Victoria, Australia (1995–2014)	12	15	14	9	51
Victoria, Australia (2010)†	21	30	25	17	7
Chennai, India (2009)†	NA	NA	NA	NA	NA
Izmir, Turkey (2006–12)	NA	NA	NA	NA	NA
Harare, Zimbabwe (2006–12)	1	3	16	5	77
Prostate					
Victoria, Australia (1995–2014)	NA	NA	NA	NA	NA
Chennai, India (2009)	NA	NA	NA	NA	NA
Izmir, Turkey (2006–12)	NA	NA	NA	NA	NA
Harare, Zimbabwe (2006–12)	0	2	13	4	81

TNM=Tumour, Node, Metastases. NA=not available. For Izmir, summary stage data are available (data not shown). *International Federation of Gynecology and Obstetrics classification used for cervix. †Research studies.

Table 1: **Distribution of TNM stage (%) for breast, cervix, colorectal, and prostate cancer cases in selected cancer registries**

	Codes		Essential TNM stages and stage groups	
Metastasis (M)				
Presence of distant metastasis	M+	NA	Distant metastasis	IV
Absence of distant metastasis	M–	NA	No distant metastasis	NA
Nodes (N)				
Presence (and extent) of regional lymph nodes	R+	R2	Regional extensive	IV/III
Presence (and extent) of regional lymph nodes	R+	R1	Regional limited	III/II
Absence of regional lymph nodes	R–	NA	No involvement of nodes	NA
Tumour (T)				
Extent of the primary tumour	A	A2	Localised advanced	III/II
Extent of the primary tumour	A	A1	Localised advanced	III/II
Extent of the primary tumour	L	L2, L1	Localised limited	II/I

TNM=Tumour, Node, Metastases. R=regional nodes. A=advanced extension. L=localised extension. NA=not applicable.

Table 2: **Essential TNM components, codes and stage groups**

Even when using the same classification system, the completeness of stage information varies greatly both between registries and by cancer site, which, in some cases, renders stage-specific comparisons between populations futile. This problem is shown in terms of the variability of TNM stage data that are available (from routine surveillance) from selected registries involved in an ongoing collaborative international study led by IARC (table 1). Although absence of staging information is more common among registries in low-resourced settings, it is not exclusively a problem of low-income and middle-income countries. In Victoria, Australia, for example, dedicated efforts were implemented to improve cancer stage data beyond those collected routinely. The percentage of colorectal cancer cases with unknown stage reduced from 51% (obtained through routine surveillance) to 7% when dedicated efforts were done in a research study to obtain stage data (table 1). Dedicated efforts to improve stage data via research studies or otherwise are expensive and time consuming and not always feasible beyond routine data collection. By comparison, completeness of stage information slightly improved using SEER Summary Stage rather than full TNM, with 52% and 32% of cases of prostate cancer in Harare, Zimbabwe and Izmir, Turkey, respectively, having no stage information (data not shown).

Essential TNM

The difficulties in ascertaining meaningful stage information at the population level for the reasons described above provide a strong rationale for developing an alternative approach to simplify the collection of these data to improve the completeness of stage captured by PBCRs, and to increase the comparability across populations, while also maintaining clinical relevance. Although a common unified staging system based on TNM is recommended and desirable, in the absence of documentation of TNM in the clinical record, a simplified but comparable alternative approach needs to be explored. A key principle of any such proposal is the need to facilitate data extraction by registrars.

With these considerations and principles in mind, a working group with representatives from the UICC, the IARC, and the IACR developed the Essential TNM staging system. This staging system can be used by cancer registrars when the standard (full) TNM stage group (I, II, III, or IV) or the individual elements for TNM staging (T, N, and M) have not been explicitly recorded in the patient's medical records. Coding guidelines and flowcharts have been developed initially for breast, cervix, colorectal, and prostate cancer, thus covering common cancers that are amenable to early detection or screening.[1]

Essential TNM has been designed to follow a logical pathway in which the extent of disease in each patient with cancer around the time of diagnosis is documented first using combined clinical and operative or pathological information, or both. If pathological information is available around the time of diagnosis, it is preferred to clinical appraisal of the same tumour. If neoadjuvant therapy (ie, systemic therapy prior to surgery) has been given, information used for staging purposes should only include procedures and records prior to the initiation of this therapy.

Essential TNM consists of the same components as the standard TNM staging system to summarise the anatomical extent of cancer in the patient, although the

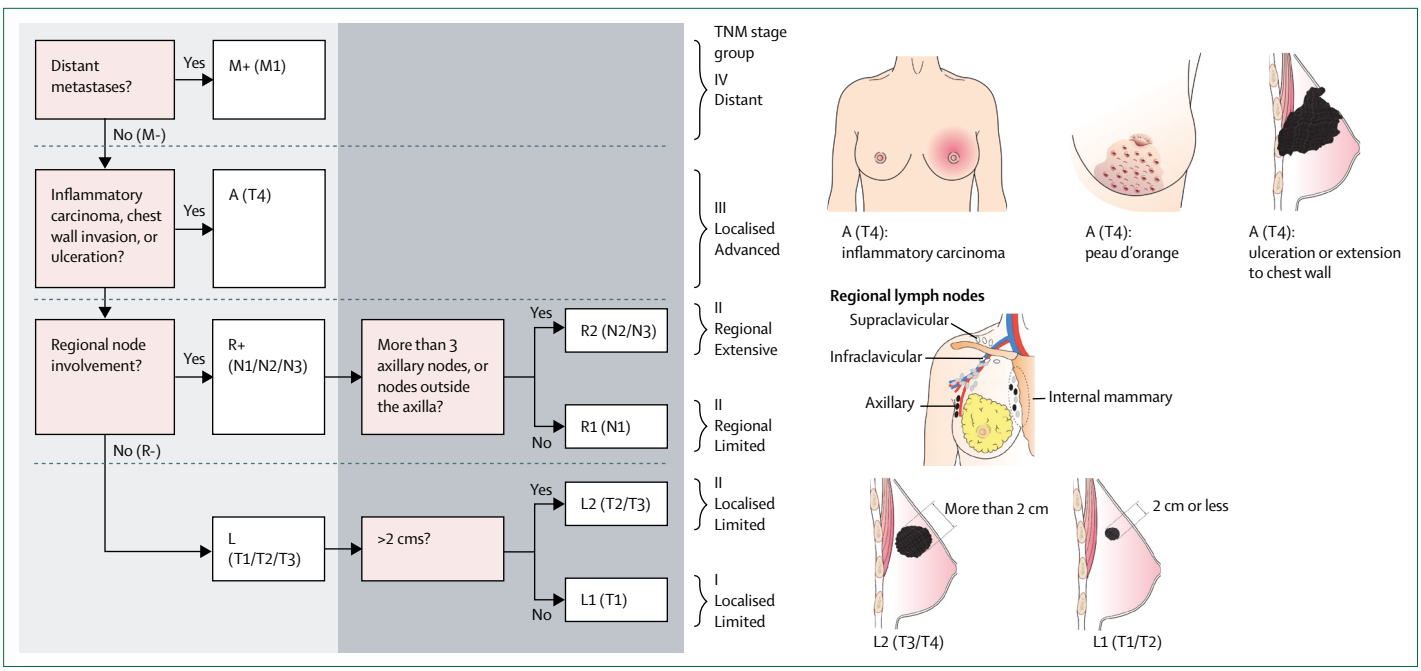

Figure 1: **Breast cancer Essential TNM flowchart**
Flowchart adapted from Brierley et al[3] and anatomical images adapted from Wittekind et al[40] by permission of Wiley. TNM=Tumour, Node, Metastasis. R=regional nodes. A=advanced extension. L=localised extension.

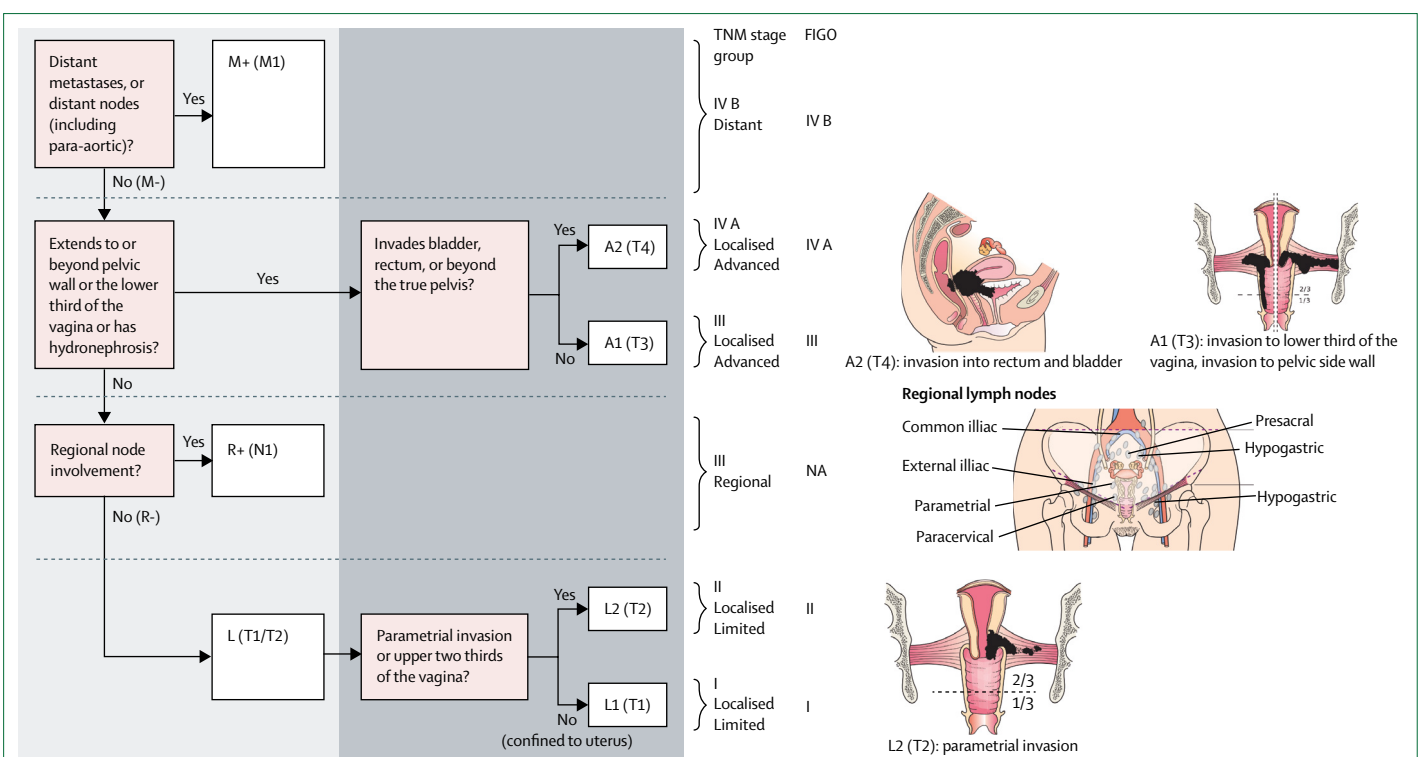

Figure 2: **Cervical cancer Essential TNM flowchart**
Flowchart adapted from Brierley et al[3] and anatomical images reproduced from Wittekind et al[40] by permission of Wiley. TNM=Tumour, Node, Metastasis. FIGO=International Federation of Gynecology and Obstetrics. R=regional nodes. A=advanced extension. L=localised extension. NA=not applicable.

decision process begins by appraising those elements corresponding to the furthest extent of disease. The components are M (presence or absence of distant metastasis), N (presence or absence of regional node metastasis), and T (extent of invasion or size of the tumour, or both).

Distant metastasis is represented by M (as in standard TNM), with codes of M+ indicating that metastases are present, and M– indicating their absence. Clinical signs and image findings are enough to justify metastasis in the absence of pathological confirmation. Similar to the TNM system, absence of any mention of metastasis is assumed to represent no metastasis (M–). Unknown categories are not represented by a specific code.

The involvement of (or metastases to) regional lymph nodes corresponds to the N category and is coded as R+ in the presence of lymph node involvement and R– in its absence. If lymph node involvement has been established (R+), Essential TNM permits a further differentiation when more detailed information is available (and it is relevant for the cancer site). R+ can then be further classified as R2, representing advanced nodal involvement, or R1, representing limited nodal involvement. This possibility of further differentiation (R2 or R1) is so far only applicable to breast cancer; in the event (unusual and rare) that presence of lymph node involvement (R+) has been established for breast cancer but no further information is available on number of nodes and location, the case will be allotted to the lower stage category (following rule 4 of TNM—eg, to Stage II Regional Limited). Similar to M, the absence of any mention of regional node involvement is assumed to represent no nodal involvement (R–).

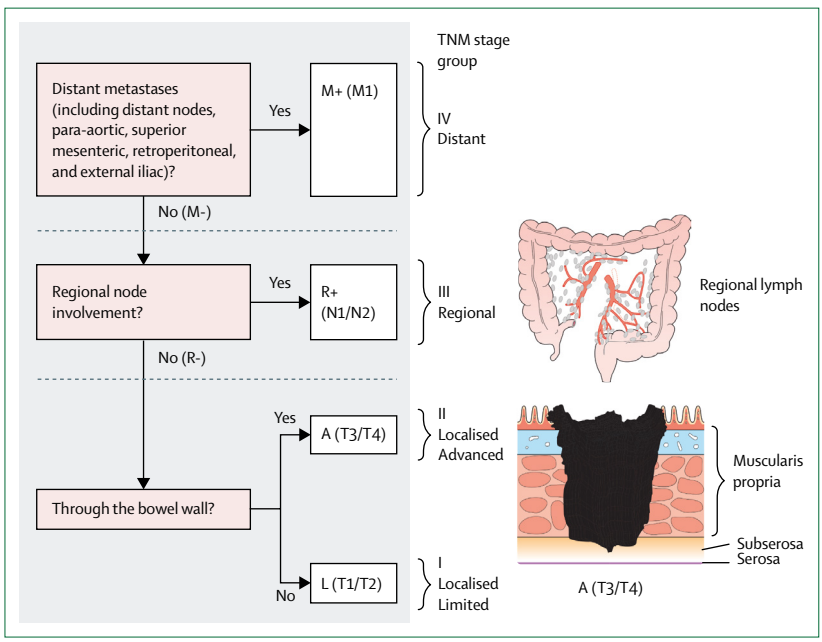

Figure 3: **Colon and rectum cancer Essential TNM flowchart**
Flowchart reproduced from Brierley et al[1] and anatomical images adapted from Wittekind et al[40] by permission of Wiley. TNM=Tumour, Node, Metastasis. R=regional nodes. A=advanced extension. L=localised extension.

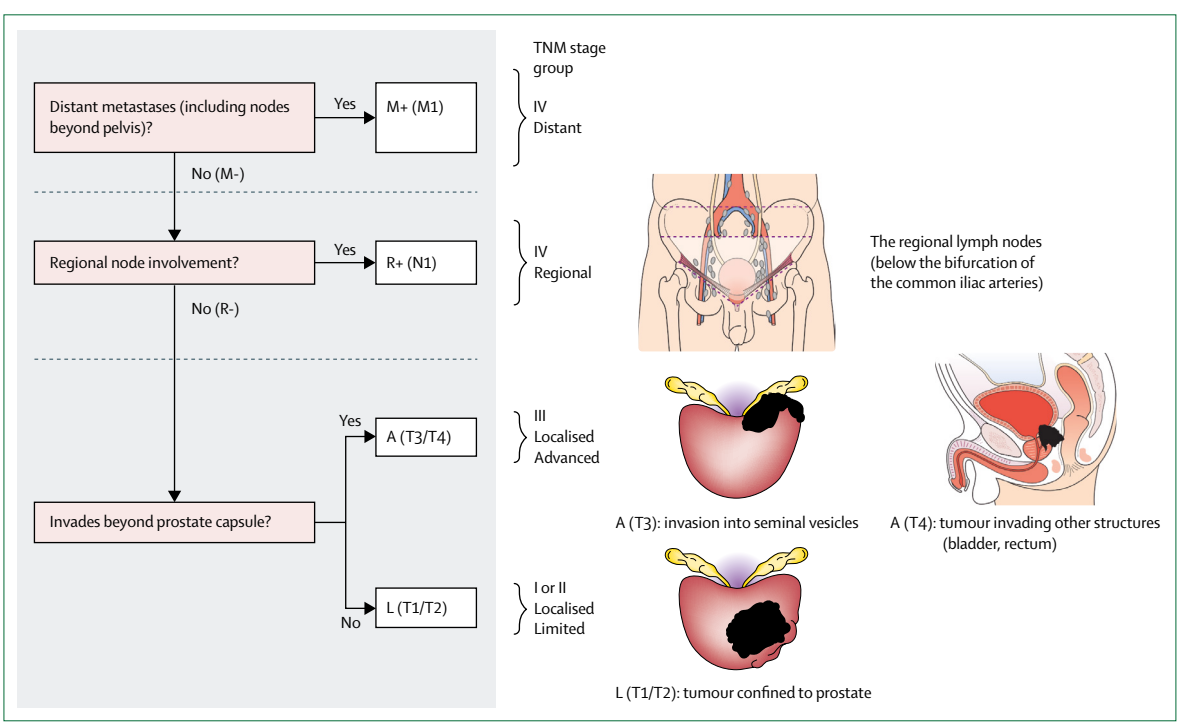

Figure 4: **Prostate cancer Essential TNM flowchart**
Flowchart adapted from Brierley et al[1] and anatomical images adapted from Wittekind et al[40] by permission of Wiley. TNM=Tumour, Node, Metastasis. R=regional nodes. A=advanced extension. L=localised extension.

The extent of invasion or tumour size, or both (T category) is coded as either advanced or limited, designated with the letters A or L, respectively. Similar to regional node involvement, certain cancer sites allow for more detailed coding when relevant information is available in the record. Code A can be subdivided into A2 (very advanced) and A1 (advanced), and code L can be subdivided into L2 (limited) and L1 (very limited).

The so called reverse logic of documenting the furthest extent allows the registrar to stop searching for additional information after the highest level of tumour progression has been recorded. For example, a male with prostate cancer with documented metastasis to the bones will be assigned M+ (and subsequently a stage IV) without need to gather information on the size of the tumour or its regional node involvement.

Once the Essential TNM elements have been coded, the different elements can be combined into stage groups ranging, with decreasing extent of disease, from IV to I. These Essential TNM stage groups are identical to the standard TNM stage groups used by clinicians. Stage IV is assigned for cancers with distant metastasis (M+); stages III and II for cancers with decreasing regional node involvement or extent in size; and stage I is typically assigned to cancers that are localised (table 2).

Data collection is facilitated by the use of Essential TNM flowcharts, which include key questions in descending order of the three components that help determine the extent of disease according to the latest UICC TNM edition. The flowcharts include visual aids that permit a better understanding of the anatomy and related terms (eg the regional nodes for the cancer of interest) that the registrar might find in a clinical record (figures 1–4). In the User's Guide, accompanying the flowcharts are general guidelines for abstraction from medical records (appendix p 4), as well as key points for staging that are relevant to each site (appendix pp 5–8), and are helpful to guide registrars further.

Since the first proposal in 2017,[1] Essential TNM has been subject to field testing in the USA, in three cancer registries in Africa, and one in Latin America. Results of field testing are as of yet unpublished, though some have been presented at the 38th Annual IACR Conference (Oct 19–21, 2016).[41] Field tests and related discussions have resulted in modifications to the flowcharts for breast, cervix, and prostate cancer that were published as an appendix of the UICC TNM 8th edition.[1] For prostate cancer, the flowcharts published still correspond to the 7th edition, whereas for breast and cervix cancer it became evident that once M has been classified as M–, the following question, in the logical order from more advanced to less advanced cancers, was to first ask for the extension of size (eg, chest wall affected for breast or rectum for cervix) rather than asking for the extension of regional nodes (as was the case in the flowcharts published in the 8th edition). In addition, field tests indicated that successful implementation of Essential TNM would require thorough training of registrars for effective use. The User's Guide (appendix pp 1–8) represents part of the material that has been developed by the IARC within the Global Initiative for Cancer Registry Development (GICR) programme for this purpose.

Search strategy and selection criteria

We identified references relevant to cancer staging at regional or global level via PubMed with the terms "surveillance", "cancer stage", "registries", "TNM", and "availability" at several stages during the writing process. We included only the most relevant references in English that were published after and including 2008. The original information contained in this Review on the global availability of staging data at the population level was quantified on the basis of the questionnaire completed by registries submitting to Cancer Incidence in Five Continents Volumes X and XI. Data on staging by cancer type were provided by cancer registries participating in the International Agency for Research on Cancer SURVCAN-3 study (except for the Victoria Cancer Registry), with permission and agreement of the corresponding coauthors. SURVCAN-3 involves collaboration and support of population-based cancer registries in countries seeking to develop local survival statistics; 86 registries from 36 countries are participating in the study. For the purpose of this Review, we included stage data provided by some randomly selected population-based cancer registries participating in SURVCAN-3 (those in table 1) as well as data provided by the Victoria Cancer Registry in Australia. The initial (face-to face) meeting to discuss a simplified Tumour, Node, Metastasis (TNM) for cancer registries in low-income and middle-income countries took place in Lyon, France in April, 2015, and the following discussions and work to refine Essential TNM were virtual and via the internet. We held periodic teleconferences to refine Essential TNM and update on related activities the coauthors from International Agency for Research on Cancer, International Association of Cancer Registries, and Union for International Cancer Control TNM Staging Group (JB, MG, BO).

For more on the **study** see http://survival.iarc.fr/Survcan/en/

For more on **GICR** see http://gicr.iarc.fr/

Conclusion

This Review emphasises that, even in the context of high-quality cancer registration, recording of stage information remains an important challenge for cancer registries. The existing variability in staging systems used by cancer registries hampers comparability at various levels because of both missing and disparate data. Furthermore, levels of incompleteness among several PBCRs that attempt to collect stage data might pose difficulties in deriving conclusions for public health purposes.

Essential TNM aims to simplify data collection in an effort to improve completeness and comparability of staging data in cancer registries. The initial focus was on cancers that are amenable to screening and early detection. Using a system compatible with those used in clinical practice (TNM 8th edition and FIGO), and accompanied by standardised training, Essential TNM aspires to improve comparability and bring consensus among clinicians and public health specialists. The application of Essential TNM, particularly in less-resourced settings, is of particular value to the GICR, which aims to improve cancer surveillance worldwide. Targeted dissemination and dedicated training courses are crucial to ensure successful adoption of the system in cancer registries. Looking to the future, Essential TNM is

expected to improve availability and comparability of staging data at the population level to support public health decision making.

Contributors

MP, DMP, KW, BO, MG, AZ, FB, and JB were involved in the conceptualisation of the Review. MP, DMP, KW, BO, AZ, FB, IS, and JB were involved in the interpretation, and MP, DMP, KW, FB, and JB wrote the Review. MP did the literature search. EC, HF, and RS retrieved data on staging from the Zimbabwe Cancer Registry, the Victoria Cancer Registry, and the Chennai Cancer Registry, respectively. ME designed the flowcharts. All authors critically revised and approved the manuscript for publication.

Declaration of interests

We declare no competing interests.

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