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Key performance indicators for monitoring the integrated care pathway in breast cancer: the E.Pic.A. project

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Abstract

Background: Due to its high incidence, evaluating performance of care delivered to breast cancer patients is a crucial issue. The multidisciplinary panel E.Pic.A. (Economic Appropriateness of an Integrated Care Pathway) defined a set of key performance indicators (KPIs) to evaluate economic waste in breast cancer healthcare interventions.

Methods: The E.Pic.A. panel identified the principal KPIs that are crucial within the breast cancer care pathway to evaluate the performance of care. KPIs were defined taking into account their reliability, validity, usability and feasibility of measurement through the linkage between multiple routine healthcare data sources.

Results: Seven KPIs were identified: three on instrumental diagnostics, two on surgery and two on treatment. The three KPIs regarding instrumental diagnostics are aimed at assessing the inappropriateness of diagnostic tests performed before and after the index surgery. The two KPIs regarding surgery measure the inappropriateness of possible repeated interventions considering the time elapsed from the index surgery. The two KPIs regarding oncologic therapy measure the inappropriateness about the administration time of adjuvant therapy and radiotherapy considering the time elapsed from the index surgery.

Conclusion: E.Pic.A methodology could help to evaluate economic waste in healthcare interventions with the objective of redirecting resources to interventions with greater value.

Keywords: Appropriateness, Breast cancer, Italian National Health System, Key performance indicators, Sustainability

Introduction

In recent decades, the Italian National Health System (INHS) has undergone a continuous and rapid process of innovation that has led to the achievement of remarkable clinical goals; as one example, the increase in life expectancy in Italy has now given it a top position in world rankings, and mortality rates for major diseases have also been reduced (1). This process of innovation, in large part due to the introduction of new drugs on the market, has also led to an increase in public drug expenditure, especially in the field of oncology. Indeed, in 2015, at €2,372 million, oncology drugs represented the highest pharmaceutical costs (10.5%) by the INHS (2).

In the face of mounting restrictions in healthcare expenditure that predictably will not undergo significant increases

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in the coming years, it seems reasonable to expect that no new financial resources will be made available to the INHS for expenditures on anti-cancer drugs, while the number of new diagnoses of cancer continues to grow (3, 4). It thus becomes increasingly important to place greater attention on increasing the efficiency of how healthcare resources are allocated along Integrated Care Pathways (ICPs), with a view on eliminating waste and saving costs. According to a recent economic analysis, waste of resources (e.g. overuse of inappropriate health interventions) increases healthcare expenditure by more than 20% (5).

To guarantee the survival of universalistic health system in such a picture where growing health needs are accompanied by rising costs and risk of wastages, the key point is to give value to healthcare that, according to Sir M. Gray, involves optimal allocation of resources (allocative value), together with a radical recovery of efficiency in a context that guarantees an unchanged or, if possible, greater effectiveness (technical–professional value) in full compliance with the individual patient's value system (personal value) (6).

In Italy, in consideration of its impact in terms of incidence (28%) and prevalence (23% of all cancer patients) in women (7), breast cancer (BC) is a paradigmatic oncological condition where one can study value along the care pathway.

In addition, BC is a complex clinical condition whose management requires a multidisciplinary approach. This has led to centralise the ICP by specialised BC units (BUs). BUs allow patients to face BC with the certainty that they will be followed by a multidisciplinary team of dedicated specialists, treated according to the highest standards and accompanied throughout the disease journey. The BU is therefore an excellent model of intervention, thanks to which adherence to shared treatment standards has improved, with outcomes of the overall treatment process that are standardised and multidimensional (8).

With the aim of increased efficiency, it becomes essential to measure the performance of the various activities needed for the ICP in BC. In the past, several multidisciplinary groups of professionals in the BU have defined a minimum set of quality indicators to measure the clinical efficacy of the ICP of BC (9, 10).

In the present study, we report the methodology developed by the E.Pic.A. (Economic Appropriateness of an Integrated Care Pathway) multidisciplinary panel (composed of clinicians, health management physicians, methodologists, IT experts), which is aimed at constructing an analytic process that allows evaluation of clinical and economic inappropriateness in BC by defining key performance indicators (KPIs) (11).

Methods

In accordance with current guidelines of the Associazione Italiana di Oncologia Medica (AIOM) (12) and the National Comprehensive Cancer Network (13), the E.Pic.A. multidisciplinary panel was asked to identify and define a series of KPIs that can be utilised to evaluate the potential inappropriateness of healthcare services in the ICP in BC. In order for the evaluation process to be homogeneously applied by all hospitals, the KPIs identified by the E.Pic.A. multidisciplinary panel had to be easily measurable using currently available and commonly used databases (e.g. administrative databases, hospital discharge card, etc.).

In particular, each of the KPIs identified had to be "reliable", i.e. subject to the lowest number of systematic errors possible, and "representative", i.e. characterised by a close relationship with the phenomenon that it intends to evaluate (14). The KPIs also had to meet two other requirements: "accessibility", or be easily measurable using the available information sources, and "operativity", or be easily applicable in the context to be evaluated, allowing identification of critical issues and monitor interventions (14). For each KPI defined, the E.Pic.A. multidisciplinary panel was asked to: (i) provide a definition, (ii) explain the methodology behind its calculation, and (iii) indicate the target for evaluation.

The present study describes only analytic methodology and does not contain any medical information about an identifiable patient. The findings will be shared with other hospitals and will be disseminated to the scientific community at conferences.

Key performance indicators

A total of seven KPIs were identified to measure inappropriateness of healthcare services provided in the ICP in BC: three for examinations, two for surgery and two for treatment. The three KPIs related to examinations were aimed at estimating the inappropriateness of diagnostic tests performed in the pre- and post-index breast surgery phases. The two KPIs for surgery measured the inappropriateness of re-surgery during the time elapsed from the index breast surgery. The two KPIs for treatment measured inappropriateness when referred to the time of administration of adjuvant therapy (chemotherapy and/or hormonal therapy) and radiotherapy after the index breast surgery.

Since the date of execution of the index breast surgery (and relative index hospitalisation) represents the time reference for calculation of each of the seven KPIs, it was essential to provide a definition that also included identification criteria. First, since it is possible to identify new BC patients undergoing breast surgery each year, the E.Pic.A. multidisciplinary panel established that the time period during which breast surgery would be identified is the calendar year (January 1 to December 31). The index breast surgery procedure was then defined as the first hospital admission for (total or partial) resection surgery in the year of observation characterised by the concomitant presence of one of the diagnostic codes according to the International Classification of Diseases 9th revision Clinical Modification (ICD-9-CM) and one of the surgical codes listed in Tables I and II. Thus, from the index breast surgery identified, the following were excluded:

- all male patients;
- patients less than 18 years of age at the index breast surgery;
- in prevalent cases, at least one hospitalisation for BC (ICD-9-CM V10.3 or 174* or 233.0) as the main or secondary diagnosis in the period between 3 years and 6 months prior to the date of the index breast surgery;

Table I - Primary and secondary diagnostic codes of the ICD9-CM

ICD-9-CM code	Diagnosis
174.*	Malignant breast tumour
233.0	In situ carcinoma of the breast

ICD-9-CM = International Classification of Diseases 9th revision Clinical Modification

Table II - ICD-9-CM codes for major and secondary surgery

ICD9-CM code	Surgery
85.20	Removal of breast tissue, no other indications
85.21	Local removal of breast lesions
85.22	Quadrantectomy of the breast
85.23	Subtotal mastectomy
85.24	Removal of ectopic breast tissue
85.25	Nipple removal
85.33	Unilateral subcutaneous mammectomy with prosthetic implant
85.34	Other unilateral subcutaneous mammectomy
85.35	Bilateral subcutaneous mammectomy with prosthetic implant
85.36	Other bilateral subcutaneous mammectomy
85.41	Single-sided simple mastectomy
85.42	Bilateral simple mastectomy
85.43	Unilateral extended single mastectomy
85.44	Simple bilateral extended mastectomy
85.45	Unilateral radical mastectomy
85.46	Bilateral radical mastectomy
85.47	Extended monolateral radical mastectomy
85.48	Extended bilateral radical mastectomy

ICD-9-CM = International Classification of Diseases 9th revision Clinical Modification.

- in cases with another neoplasm, at least one hospital admission (ICD-9-CM 140*-173* or 176*-195 or 200-208* or V.10*excluding V10.3) for a main or secondary diagnosis different from BC in the 3 years preceding and 6 months after the index breast surgery;
- presence of metastatic disease at hospitalisation (ICD9-CM 197*, 198*, 199*) for the index breast surgery or during hospitalisation in the three years preceding the index hospital admission.

Lastly, to determine staging of the BC, which is fundamental in the measurement of KPIs, the E.Pic.A. multidisciplinary panel adopted the tumour, node, metastases (TNM) coding described in the AIOM 2017 guidelines (15) listed in Table III; preference was given to pathological TNM staging, while clinical staging was used as an alternative. For each of the seven KPIs, the definitions, reference targets and calculation methods used by the E.Pic.A. multidisciplinary panel are provided.

Table III - Tumour, node, metastases staging of breast cancer

Stage	Primary tumour	Lymph node involvement	Distant metastasis
Stage 0	Tis	N0	M0
Stage IA	T1*	N0	M0
Stage IB	T0	N1 mi	M0
	T1*	N1 mi	M0
Stage IIA	T0	N1**	M0
	T1*	N1**	M0
	T2	N0	M0
Stage IIB	T2	N1	M0
	T3	N0	M0
Stage IIIA	T0	N2	M0
	T1*	N2	M0
	T2	N2	M0
	T3	N1	M0
	T3	N2	M0
Stage IIIB	T4	N0	M0
	T4	N1	M0
	T4	N2	M0
Stage IIIC	All T	N3	M0
Stage IV	All T	All N	M1

M0 includes M0 (i+).
A pM0 designation is not valid; any M0 should be clinical.
If a patient presents with M1 before neoadjuvant systemic therapy, the stage is considered IV and remains IV independently of the response to neoadjuvant therapy.
The stage may change if diagnostic imaging reveals the presence of distant metastases, provided that they were performed within 4 months of diagnosis in the absence of disease progression and that the patient did not undergo neoadjuvant therapy.
The "yc" and "yp" prefixes indicate the classification after neoadjuvant therapy. No staging is indicated if a complete pathological response is achieved (e.g. ypT0N0 cM0).
*T1 includes T1mic.
**T0 and T1 tumours with only micro-metastases to lymph nodes are excluded from stage IIA and classified as stage IB.

Examinations KPIs

KPI-1: pre-surgery

Definition. The first KPI evaluates the percentage of patients with stage I–II BC in whom, during 60 days prior to the index breast surgery, at least one of the following examinations was performed: hepatic ultrasound, computed tomography (CT), magnetic resonance imaging (MRI), bone scan or positron emission tomography (PET). Table IV lists the codes used to identify the examinations, as defined by the E.Pic.A. multidisciplinary panel. The patients with BC who underwent PET must also have been evaluated for stage III BC.

Target. The percentage for KPI-1 should not exceed 5%, except for MRI for which a maximum of 10% was considered acceptable (16).

Calculation. The percentage must be calculated by indicating in the numerator the number of patients with stage I–II

Table IV - Codes for examinations

Hepatic ultrasound
88.74.1 – Upper abdominal ultrasound
88.74.2 – Echo colour Doppler liver and biliary tract
88.74.3 – Echo colour Doppler pancreas
88.74.4 – Echo colour Doppler spleen
88.74.5 – Echo colour Doppler kidney and adrenal glands
88.75.1 – Lower abdominal ultrasound
88.75.2 – Echo colour Doppler lower abdomen
88.76.1 – Complete abdominal ultrasound
Computed tomography
87.03 – Head CT
87.03.1 – Head CT with and without contrast
87.03.2 – Maxillofacial CT
87.03.3 – Maxillofacial CT with and without contrast
87.03.7 – Neck CT
87.03.8 – Neck CT with and without contrast
87.41 – Thoracic CT
87.41.1 – Thoracic CT with and without contrast
87.42.1 – Thoracic bilateral tomography
87.42.2 – Thoracic monolateral tomography
88.01.1 – Upper abdomen CT
88.01.2 – Upper abdomen CT with and without contrast
88.01.3 – Lower abdomen CT
88.01.4 – Lower abdomen CT with and without contrast
88.01.5 – Complete abdominal CT
88.01.6 – Complete abdominal CT with and without contrast
88.01.7 – CT with and without contrast medium for staging
88.38.1 – CT vertebral column
88.38.2 – CT vertebral column with and without contrast
88.38.3 – Upper limb CT
88.38.4 – Upper limb CT with and without contrast
88.38.5 – CT pelvis
88.38.6 – Lower limb CT
88.38.7 – Lower limb CT with and without contrast
88.90.3 – CT vertebral column
Magnetic resonance imaging
88.91.1 – MRI brain and encephalic trunk
88.91.2 – MRI brain and encephalic trunk with and without contrast
88.91.3 – Maxillofacial MRI
88.91.4 – Maxillofacial MRI with and without contrast
88.91.5 – Angio-MRI intracranial vascular district
88.92 – Thoracic MRI
88.92.1 – Thoracic MRI with and without contrast
88.92.2 – Thoracic angio-MRI
88.92.6 – MRI breast (monolateral)
88.92.7 – MRI breast with and without contrast (monolateral)
88.92.8 – MRI breast (bilateral)
88.92.9 – MRI breast with and without contrast (bilateral)
88.93 – Vertebral MRI
88.93.1 – Vertebral MRI with and without contrast
88.94.1 – Musculoskeletal MRI
88.94.2 – Musculoskeletal MRI with and without contrast
88.94.3 – Angio-MRI upper or lower limb
88.94.4 – Angio-MRI of upper or lower limbs
88.95.1 – MRI upper abdomen
88.95.2 – MRI upper abdomen with and without contrast
88.95.3 – Angio-MRI upper abdomen
88.95.4 – Lower abdomen and pelvic MRI
88.95.5 – Lower abdomen and pelvic MRI with and without contrast
88.95.6 – Angio-MRI lower abdomen
88.95.7 – MRI upper and lower abdomen
88.95.8 – MRI upper and lower abdomen with and without contrast medium
88.95.9 – Angio-MRI upper and lower abdomen
Bone scan
92.05.6 – Bone scintigraphy total body
92.14.1 – Bone scintigraphy articular segment
92.14.2 – Bone scintigraphy polyphasic articular segment
92.14.3 – Segmental skeletal tomoscintigraphy (SPECT), planar examination, with single radiopharmaceutical administration
92.18.2 – Bone or articular scintigraphy
Positron emission tomography
92.11.7 – PET (quantitative)
92.18.6 – Total body PET

CT = computed tomography; MRI = magnetic resonance imaging; PET = positron emission tomography; SPECT = Single Photon Emission Computed Tomography.

BC (defined according to Tab. III) who, within 60 days prior to the index breast surgery (defined according to the ICD-9-CM codes reported in Tabs. I and II), underwent at least one examination among those reported in Table IV. The denominator refers to the number of patients with stage I–II BC (defined according to Tab. III) and index breast surgery (defined according to the ICD-9-CM codes in Tabs. I and II).

KPI-2: post-surgery

Definition. The second KPI evaluates the percentage of patients with stage I–II BC in whom, during 60 days after the index breast surgery, at least one of the following examinations was performed: hepatic ultrasound, CT, MRI, bone scan

or PET (Tab. IV). The percentage of patients with BC who underwent PET must also have been evaluated for stage III BC.

Target. The percentage for KPI-2 should not exceed 5%.

Calculation. The percentage must be calculated by indicating in the numerator the number of patients with stage I–II BC (defined according to Tab. III) who, within 60 days after the index breast surgery (defined according to the ICD-9-CM codes reported in Tabs. I and II), underwent at least one examination among those reported in Table IV. The denominator refers to the number of patients with stage I–II BC (defined according to Tab. III) and index breast surgery (defined according to the ICD-9-CM codes shown in Tabs. I and II).

KPI-3: follow-up

Definition. The third KPI evaluates the percentage of patients with stage I–II BC who, starting from 60 days after the index breast surgery and up to 365 days after this surgery, underwent at least one of the following examinations: CT, MRI, bone scan or PET (Tab. IV).

Target. The percentage for KPI-3 should not exceed 5%.

Calculation. The percentage must be calculated by indicating in the numerator the number of patients with stage I–II BC (defined according to Tab. III) who, starting from 60 days after the index breast surgery (defined according to the ICD-9-CM codes in Tabs. I and II) and up to 365 days after this surgery, underwent at least one of the examinations indicated in Table IV, except for hepatic ultrasound. The denominator refers to the number of patients with stage I–II BC (defined according to Tab. III) and index breast surgery (defined according to the ICD-9-CM codes shown in Tabs. I and II).

Surgery KPIs

KPI-4: subsequent breast reconstruction/axillary dissection

Definition. The fourth KPI evaluates the percentage of patients with BC who, within 90 days of the index mastectomy, underwent subsequent surgery for breast reconstruction and/or axillary dissection. Table V shows the ICD-9-CM codes selected by the E.Pic.A. multidisciplinary panel to identify breast reconstruction and axillary dissection.

Table V - Codes for breast reconstruction and axillary lymph node dissection

Axillary lymph node dissection
40.51 – Radical dissection of axillary lymph nodes
Breast reconstruction
85.7 – Total breast reconstruction
85.8 – Other reparative and plastic breast interventions
85.81 – Suture and laceration of the breast
85.82 – Partial thickness graft in the breast
85.83 – Full thickness graft in the breast
85.84 – Pedunculated graft of the breast
85.85 – Breast reconstruction with muscle or musculocutaneous flap
85.86 – Nipple transposition
85.87 – Other repair or reconstruction of the nipple
85.89 – Other mammoplasty

Target. The percentage for KPI-4 should be close to 0%.

Calculation. The percentage must be calculated by indicating in the numerator all patients with BC who, within 90 days of the index mastectomy (defined according to the ICD-9-CM codes in Tab. I and ICD-9-CM codes 85.4* in Tab. II), underwent subsequent surgery for breast reconstruction and/or axillary dissection (defined by the ICD-9-CM codes in Tab. V). The denominator refers to the number of patients with BC and index mastectomy (defined according to the ICD-9-CM codes in Tab. I and ICD-9-CM codes 85.4* in Tab. II).

When possible, KPI-4 must be evaluated by subgrouping the subsequent surgery by breast reconstruction (KPI-4a) and axillary dissection (KPI-4b).

KPI-4a: subsequent breast reconstruction

Definition. KPI-4a evaluates the percentage of patients with BC who, within 90 days of the index mastectomy, underwent subsequent surgery for breast reconstruction.

Target. The percentage for KPI-4a should be close to 0%.

Calculation. The percentage must be calculated by indicating in the numerator all patients with BC who, within 90 days of the index mastectomy (defined according to the ICD-9-CM codes reported in Tab. I and ICD-9-CM codes 85.4* in Tab. II), underwent subsequent surgery for breast reconstruction (defined as ICD-9-CM 85.7, 85.8 and 85.8* in Tab. V). The denominator refers to the number of patients with BC and index mastectomy (defined according to the ICD-9-CM codes in Tab. I and ICD-9-CM codes 85.4* in Tab. II).

KPI-4b: subsequent axillary dissection

Definition. KPI-4b evaluates the percentage of patients with BC who, within 90 days of the index mastectomy, underwent subsequent surgery for axillary dissection.

Target. The percentage for KPI-4a should be close to 0%.

Calculation. The percentage must be calculated by indicating in the numerator all patients with BC who, within 90 days of the index mastectomy (defined according to the ICD-9-CM codes reported in Tab. I and ICD-9-CM codes 85.4* in Tab. II), underwent subsequent surgery for axillary dissection (defined by code ICD-9-CM 40.51 in Tab. V). The denominator refers to the number of patients with BC and index mastectomy (defined according to the ICD-9-CM codes in Tab. I and ICD-9-CM codes 85.4* in Tab. II).

KPI-5: subsequent surgery

Definition. This KPI evaluates the percentage of patients with BC who underwent a subsequent surgery within 120 days following a conservative (partial resection) index breast surgery.

Target. The percentage of KPI-5 should be close to 0%.

Calculation. The percentage must be calculated by indicating in the numerator all patients with BC who underwent a subsequent surgery (defined according to the ICD-9-CM codes in Tabs. I and II) within 120 days following a conservative (partial resection) index breast surgery (defined by the ICD-9-CM codes in Tab. I and ICD-9 codes in Tab. II, excluding those for ICD-9-CM mastectomy 85.4*), excluding patients

with repeated surgery during the same hospitalisation. The denominator refers to the number of patients with BC who underwent a subsequent surgery following a conservative (partial resection) index breast surgery (defined by the ICD-9-CM codes in Tab. I and ICD-9 codes in Tab. II, excluding those for ICD-9-CM mastectomy 85.4*).

Treatment KPIs

KPI-6: treatment timing

Definition. The sixth KPI evaluates the percentage of patients with BC who, as candidates for chemotherapy and/or hormone therapy and without evidence of disease, initiated adjuvant treatment (chemotherapy and/or hormone therapy as the only pharmacological therapy in the adjuvant setting) within 60 days of the index breast surgery. The strategy defined by the E.Pic.A. multidisciplinary panel to calculate KPI-6 focused on identification of all administrations of chemotherapy and/or hormone therapy subsequent to the date of the index breast surgery. Table VI lists the sources and the codes to identify administrations of chemotherapy and/or hormone therapy.

Table VI - Codes used for chemotherapy and hormone therapy

Chemotherapy
SPA database
99.25 – Injection or infusion of chemotherapy for tumour
99.25.4 – Antitumoural therapy with infusion of drug
99.25.5 – Antitumoural therapy with oral drugs or IM or subcutaneous injection
8901F0 – Antitumoural therapy with oral drugs or IM or subcutaneous injection excluding costs of drugs used for therapy per session (cycle with up to 30 sessions)
992501 – Antitumoural therapy with infusion of drug – excluding costs of drugs used for therapy per session (cycle with up to 30 sessions)
From hospital discharge sheets
Admissions with diagnosis (all positions) V58.1, and codes (all positions) 99.25 and diagnosis-related group of 410.*
V58.11 – Antineoplastic chemotherapy
V58.12 – Antineoplastic immunotherapy
99.25 – Injection or infusion of chemotherapy for tumour
410 M – Chemotherapy not associated with secondary diagnosis of acute leukaemia
ATC hormone therapy
From pharmacy databases
L02AE02 – Leuprorelin
L02AE03 – Goserelin
L02AE04 – Triptorelin
L02BA01 – Tamoxifen
L02BG03 – Anastrozole
L02BG04 – Letrozole
L02BG06 – Exemestane

ATC = Anatomical Therapeutic Chemical Classification System.

Target. The percentage of KPI-6 should be close to 100%.

Calculation. The percentage must be calculated by indicating in the numerator all patients with BC who, as candidates for chemotherapy and/or hormone therapy and without evidence of disease, initiated adjuvant treatment (chemotherapy and/or hormone therapy with the codes in Tab. VI) within 60 days from the index breast surgery (ICD-9-CM codes in Tabs. I and II). The denominator refers to the number of patients with BC who, as candidates for chemotherapy and/or hormone therapy and without evidence of disease, began adjuvant treatment (chemotherapy and/or hormone therapy with the codes in Tab. VI) within 180 days from the index breast surgery (defined according to the ICD-9-CM codes shown in Tabs. I and II). The calculation of the KPI is referred to the following time intervals: 0–30 days, 31–45 days, 46–60 days, 61–90 days and 90–180 days. Whenever possible, KPI-6 must be evaluated by subgrouping the treatment by chemotherapy (KPI-6a) and hormone therapy (KPI-6b).

KPI-6a: chemotherapy timing

Definition. KPI-6a evaluates the percentage of patients with BC who, as candidates for chemotherapy and without evidence of disease, started adjuvant chemotherapy within 60 days of the index breast surgery.

Target. The percentage of KPI-6a should be close to 100%.

Calculation. The percentage must be calculated by indicating in the numerator all patients with BC who, as candidates for chemotherapy and without evidence of disease, started chemotherapy in the adjuvant setting (codes in Tab. VI) within 60 days of the index breast surgery (defined by ICD-9-CM codes in Tabs. I and II). The denominator refers to the number of patients with BC who, as candidates for chemotherapy and without evidence of disease, started chemotherapy in the adjuvant setting (codes in Tab. VI) within 180 days from the index breast surgery (defined according to the ICD-9-CM codes in Tabs. I and II). Calculation of the KPI is referred to the following time intervals: 0–30 days, 31–45 days, 46–60 days, 61–90 days and 90–180 days.

KPI-6b: hormone therapy timing

Definition. KPI-6b evaluates the percentage of patients with BC who, as candidates for hormone therapy and without evidence of disease, started hormone therapy in the adjuvant setting within 60 days of the index breast surgery.

Target. The percentage of KPI-6b should be close to 100%.

Calculation. The percentage must be calculated by indicating in the numerator all patients with BC who, as candidates for hormone therapy and without evidence of disease, started hormone therapy in the adjuvant setting (identification codes in Tab. VI) within 60 days of the index breast surgery (defined by the ICD-9-CM codes in Tabs. I and II). The denominator refers to the number of patients with BC who, as candidates for hormone therapy and without evidence of disease, started hormone therapy in the adjuvant setting (codes in Tab. VI) within 180 days from the index breast surgery (defined according to the ICD-9-CM codes in Tabs. I and II). Calculation of the KPI is referred to the following time intervals: 0–30 days, 31–45 days, 46–60 days, 61–90 days and 90–180 days.

Table VII - Radiotherapy codes

ASA – SPA – Flow C: Radiotherapy codes
92.23.2 – Telecobalt therapy multiple fields, moving
92.24.01 – Teletherapy with linear accelerator with multiple fields or movement for 3D technique
92.24.02 – Teletherapy with linear accelerator with multiple fields or movement with modulation of intensity
92.24.1 – Teletherapy with linear accelerator fixed field
92.24.2 – Teletherapy with linear accelerator with multiple fields, moving
92.24.3 – Teletherapy with linear accelerator flash technique
92.24.B – Radiotherapy with linear accelerator with MLC for IMRT static or dynamic multiple fields or moving
92.25.1 – Electron beam teletherapy with one or more fixed fields
92.25.2 – Total skin electron irradiation (TSEI/TSEBI)

IMRT = Intensity Modulated Radiotherapy; MLC = Multileaf Collimator; TSEI = Total skin electron irradiation; TSEBI = Total Skin Electron Beam Irradiation

KPI-7: radiotherapy timing

Definition. The last KPI evaluates the percentage of patients with BC who underwent partial resection surgery and who, as candidates for radiotherapy, initiated radiotherapy within 180 days of the last surgery, if no adjuvant treatment was administered, or within 270 days, if adjuvant treatment was administered. Table VII lists the codes identified by the E.Pic.A. multidisciplinary panel for radiotherapy.

Target. The percentage of KPI-7 should be close to 100%.

Calculation. The percentage must be calculated by indicating in the numerator all patients with BC who, as candidates for radiotherapy, received at least one radiotherapy session (Tab. VII) within 180 days of the last partial resection surgery (based on ICD-9-CM codes in Tab. I and ICD-9 codes in Tab. II, excluding those for ICD-9-CM mastectomy 85.4*), if no adjuvant therapy was administered, or within 270 days, if adjuvant therapy was given. The denominator refers to the number of patients with BC who, as candidates for radiotherapy, began at least one radiotherapy session (identification codes in Tab. VII) within 365 days from the last partial resection surgery (according to the ICD-9-CM codes reported in Tab. I and ICD-9-CM codes in Tab. II, excluding those for mastectomy 85.4*).

Discussion and conclusions

The methodology developed by the E.Pic.A. multidisciplinary panel in the present study evaluated the ICP of BC patients, and identified a set of KPIs that examine some of the most critical factors related to the efficiency of a process or particular activity (11).

It is likely that one of the biggest problems with the INHS is the cascading effect of the decision-making process combined with poor overall accountability of the system. The public payor is different from those who prescribe (clinicians) and, without adequate planning and structuring of the INHS, the process of allocating resources often becomes complex and flawed, making it impossible to efficiently use the available resources. Therefore, providing tools to guide the treatment pathway for both economic (general managers) and clinical (clinicians) decision makers represents the attempt to bridge the gap between those who prescribe and those who are in charge of economic resources. In this light, clinical/administrative data are useful for constructing an accurate representation of real-word practice, in which all the different stakeholders who provide healthcare services can make their own evaluations in a systematic manner.

As already indicated herein, within a context characterised by ever-increasing healthcare needs, it would be impracticable to believe that increasing resources will become available in the near future. Hence, the E.Pic.A. multidisciplinary panel developed a methodology to identify inappropriate (or potentially inappropriate) activities that allow, within a specified ICP, reduction of waste so that new resources can be made available. The application of this methodology should allow achievement of short-term (reduction of inappropriateness), medium-term (ensure clinical outcomes while reducing waste) and long-term (reduce waiting lists and increase availability of healthcare technologies) objectives. This would thus increase the value of the healthcare services provided by the INHS. In fact, by improving allocation of resources in relation to burden of illness and need for healthcare, it is possible to increase the performance of both hospitals and professionals (technical–professional value), in line with the highest expectations of each individual patient (personal value).

Compared to the core set of parameters defined by EUSOMA (European Society of Breast Cancer Specialists) (9), composed of 17 indicators to evaluate quality of treatment pathways for BC, the seven KPIs defined by the E.Pic.A. multidisciplinary panel are mainly aimed at identification of potential inappropriateness related to providing unnecessary services during the ICP of BC. Specifically, the methodology attempts to identify potential areas with low "value" in terms of utilisation of resources, and reducing the associated costs. An initial and partial application of this methodology has recently been carried out at the Istituto Scientifico Romagnolo per lo Studio e la Cura dei Tumori IRST of Meldola (Forlì, Italy) (17). The study estimated that the hospital provided 2,516 inappropriate examinations (from January 2010 to June 2016) with a total cost of about €580,000.

The present methodology will be applied at regional (*Agenzia Regionale di Sanità Toscana, Istituto per lo studio, la prevenzione e la rete oncologica Toscana*, and *Azienda Sanitaria Locale CN2 Piemonte*) and local levels (*Istituto Scientifico Romagnolo per lo Studio e la Cura dei Tumori IRST of Meldola, Forlì, Italy* and *Istituto di Sanità Pubblica Sezione di Igiene dell'Università Cattolica del Sacro Cuore, Rome, Italy*) with the aim to provide a more complete picture of inappropriateness and waste, allowing resources to be redirected towards more valuable interventions/examinations for patients with BC (not only), and close the gap between correct use of resources and achieving the best clinical results.

Disclosures

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