



St. Paul Hospital Millennium Medical College
Graduate Study Program

Assessment of appropriateness of follow up CT on oncologic patients who have
follow up at Saint Paul's Hospital Millennium Medical College, Addis Ababa

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Addis Ababa Ethiopia

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Abbreviation and Acronyms

ACR	American College of Radiology
ESR	European Society of Radiology
CT	Computed tomography
MRI	Magnetic Resonance Imaging
NCCN	National comprehensive cancer network
OR	Odds Ratio
P	P-value
SPHMMC	St Paul's Millennium Medical College
SPSS	Statistical Package for Social Science
X ²	chi-square

Abstract

Introduction: Follow-up is the medical care of patients once their treatment has been completed. Radiologic imaging particularly CT is part of follow up care, so that appropriate CT request is important to avoid CT related adverse effects like high radiation dose, health care cost, increasing waiting time and contrast related adverse effect.

Objective: - To assess appropriateness of follow up CT on oncologic patients at st. paul millennium medical college referral hospital and to identify factors related to inappropriateness.

Material and methods: Institutional based retrospective study conducted between June 7, 2024 to June 30, 2024. The study subject were selected using systematic sampling technique. Bivariable and multivariable logistic regression analysis were done, Odds ratio (OR) and P-value (P) were used to determine strength of association and to look statistical significance association.

Result Two hundred ninety nine (84.5 %) were not considered appropriate on the basis of the information available from the medical record. The most common cause of Inappropriateness were CT examinations both with and without contrast (n=289) followed by extended to unnecessary anatomical scan region (n=70). No statistically significant difference was found in age, sex, scan region, and primary cancer between appropriate and inappropriate examinations. The only variable significantly associated with inappropriateness was CT scan done both with and without contrast and type of primary cancer

Conclusion: This study shows that majority of oncological patients don't follow standard guidelines. Mainly due to CT examination done with and without contrast, CT scan done both with and without contrast and type of primary cancer shows significant association with inappropriateness.

Key Words: Follow up care, oncologic patient, computed tomography and level of appropriateness.

1. Introduction

1.1 Background of the study

In 2022, there were an estimated 20 million new cancer cases and 9.7 million deaths. The estimated number of people who were alive within 5 years following a cancer diagnosis was 53.5 million. About 1 in 5 people develop cancer in their lifetime, approximately 1 in 9 men and 1 in 12 women die from the disease. Three major cancer types globally in 2022 are lung, breast and colorectal cancers (1).

In 2020, 801 392 new cancer cases and 520 158 cancer deaths were estimated to have occurred in sub-Saharan Africa. Cancers of the breast (129 400 female cases) and cervix (110 300 cases) were responsible for three in ten of the cancers diagnosed in both sexes. Breast and cervical cancer were the most common cancers, ranking first in 28 and 19 countries, respectively. In men, prostate cancer led in terms of incidence (77 300 cases), followed by liver cancer (24 700 cases) and colorectal cancer (23 400 cases). Prostate cancer was the leading incident cancer in men in 40 sub-Saharan Africa countries (2).

In Ethiopia, cancer accounts for about 5.8% of total national mortality. Although population-based data do not exist in the country except for Addis Ababa, it is estimated that the annual incidence of cancer is around 60,960 cases and the annual mortality is over 44,000. For people under the age of 75 years, the risk of being diagnosed with cancer is 11.3% and the risk of dying from the disease is 9.4%. The most prevalent cancers in Ethiopia among the adult population are breast cancer (30.2%), cancer of the cervix (13.4%) and colorectal cancer (5.7%). About two-thirds of reported annual cancer deaths occur among women (3).

Cancer treatment modalities have improved significantly in the past few decades, leading to a higher number of cancer survivors(4, 5). After curative treatment for cancer, most patients receive oncological follow-up care by a specialist in the hospital (4).

Follow-up is the medical care of patients once their treatment has been completed. The goals of follow-up include providing psycho-social support in the reintegration of patients into family and professional life, as well as detecting relapses and complications that may be due to their disease or treatment. It is assumed that early recognition of disorders is beneficial (5). These visits consist of physical examinations, blood tests with measurement of serum tumor markers, and radio graphic imaging (4).

Computed tomography (CT) is the main diagnostic tool in oncologic imaging, and it is widely used for tumors detection, staging and follow-up (6). Therefore, CT follow-up examinations represent a significant proportion of the diagnostic tests requested by specialist physicians, with remarkable consequences.

1.2 Statement of the problem

CT contribute to up to 65% of the medically induced radiation exposure (7) and delivers a higher dose compared with other conventional imaging modalities and it is associated with an increased risk of radiation-induced cancer (8, 9). This issue may be even more concerning in the oncologic setting, considering the high number of CT scans these patients undergo from diagnosis to the assessment of therapy response. A second major consequence is that such advanced medical technology drives a substantial and rapidly increasing amount of healthcare costs (10). Third, another worrisome result is the lengthening of waiting list, which jeopardizes the effectiveness of the follow-up itself with potentially worse patient outcome and delayed diagnosis/improper

treatment (11). Finally contrast related adverse reactions, in particular, allergic reactions and contrast-induced nephropathy (12).

A significant proportion of radiological test requests remain inappropriate. In some recent study, (29.4 %) ontological patients were found to have undergone CT exams outside of agreed-upon diagnostic appropriateness criteria (13). Other authors have observed that only slightly half of 2,300 test requests in outpatients followed appropriateness criteria (14). another study reported that inappropriate radiology imaging were 26 % (15). One study on compliance with NCCN (national comprehensive cancer network) guidelines was only 34.5%, compliance with NCCN guidelines was associated with a reduced risk of mortality(16).

1.3 Rational of the study

The increasing demand for CT examinations has put rising pressure on radiologists and it get worse with inappropriate CT request. In appropriate CT image also expose the patient to unnecessary cost, increased waiting time, radiation exposure and contrast related adverse effect, To the extent of my search, one study has specifically investigated the appropriateness of CT examinations in the setting of oncologic follow up worldwide and no researches done in Ethiopia. It is crucial assessing appropriateness of follow up CT imaging on oncologic patient and associated risk factor in order to forward possible strategies to provide better quality care, to efficiently utilize the limited resource available and to avoid CT related adverse effect.

2. Literature review

For medical services with particular risk of complications, the benefits of a procedure must outweigh the harmful factors. In radiology, appropriateness is the key element in the justification of diagnostic imaging. Both, the American College of Radiology (ACR) and the European Society of Radiology (ESR) define appropriateness of a radiological procedure by the evidence-based advantageousness of the risk–benefit ratio (17).

According to several studies the inappropriateness rates are high, study done on oncologic patient (29.4%) imaging procedures were rated as inappropriate (13), another study done on outpatient primary care setting reported that 26% were not considered appropriate on the basis of the information available from the medical record (15), a study done in south Italy on hospitalized patient over all inappropriate imaging were 6 % and 14 % for Magnetic Resonance Imaging (MRI) and CT respectively (18), the other study done on appropriate use of chest CT-Scans in the diagnosis of hospitalized patients in Shiraz teaching hospitals, Southern Iran the rate of inappropriate chest CT were 38 % (19). Appropriateness of Head CT Scans done at Tikur Anbessa Specialized Hospital, Ethiopia, inappropriate level was 11.7 % (20).

Causes of inappropriate utilization include medical liability fears, economically motivated in-office self-referral, patient demand, regional differences in practice style, and physician experience and training in the appropriate use of newer imaging modalities. (21, 22). In a study done on oncologic patient the reasons identified for inappropriateness were shorter time interval with respect to that recommended by the guidelines; 59 examinations were extended to unnecessary anatomical can region, in 47 cases the examinations were not recommended at all, while 29 examinations were rated as inappropriate for combination of the previous causes (13).

No statistically significant difference was found in age distribution between appropriate (65 ± 12) and inappropriate (66 ± 12) examinations ($p = 0.473$). Regarding categorical variables, no scan region or type of primary cancer presented significantly different distributions between appropriate and inappropriate examinations. The only one variable significantly associated with inappropriateness was being referred by unit 2 ($p = 0.009$)(13). There was statistically significant association between inappropriate scans and young age (Under 14yrs) [AOR= 94.431 CI= 11.748-5102.402, $p=0.04$] and use of IV contrast agent [AOR= 772.673, CI = 165.219-9154.197, $P < 0.0001$](20). Among the variables, higher rates of CT scan without indication were observed among patients with chief complaint of loss of consciousness and patients with a diagnosis of heart failure or overload. Also, appropriate CT scans were significantly higher among patients with malignancies and PTE(19), appropriate CT examinations were significantly more likely in subjects with an urgent admission ($\chi^2=6.36$, 1 df, $P=0.012$), with a shorter hospital stay ($t=-1.98$, 637 df, $P=0.047$), in those who received CT examinations without contrast agent ($\chi^2=48.49$, 1 df, $P<0.001$), or only one CT examination. Appropriateness of CT examinations was also associated with a confirmation of the diagnostic hypothesis ($\chi^2=87.41$, 1 df, $P<0.001$) (18).

3. Objectives:

3.1 General objective

- ✓ The general objective of the study was to assess appropriateness of follow up CT on oncologic patients at SPHMMC referral hospital and to identify factors related to inappropriateness.

3.2 Specific objectives

Specific objective of the study were

- ✓ To assess the level of appropriateness of follow up CT on oncologic patients
- ✓ To identify factors related to level of inappropriateness

4. Materials and methods

4.1 Study area

This study was conducted at St Paul's Millennium Medical College (SPHMMC), and the hospital was established in 1968 by the late Emperor Haile Selassie, the college has more than 2800 clinical, academic and administrative and support staffs that provide medical specialty services to patients who are referred from all over the country, teaching medicine and nursing students and doing basic and applied researches. While the inpatient capacity is more than 700 beds, The College sees an average of 1200 emergency and outpatient clients daily.

4.2 Study period

The study was conducted from June 7, 2024 to June 30, 2024.

4.3 Study design

An institutional based retrospective study was carried out among oncologic follow up patients attending SPHMMC during the past 6 months.

4.4 Population

4.4.1 Source population

All cancer patients who have follow up visit in St Paul's Millennium Medical College referral hospital.

4.4.2 Study population

Oncologic patient who were sent for follow up CT at the hospital from Dec 1, 2023 to May 30, 2024.

4.5 Sample size and Sampling technique

4.5.1 Sample size:

The sample size was calculated by using single population proportion formula.

$N = Z^2 P(1-P) / d^2$ (where $Z=1.96$ at 95% confidence; p = percent of level of appropriateness; $q=1-p$;
 d = absolute allowable error. For this study we presumed maximum variability, therefore $p= 0.70$

(13) $q=0.30$; $d=5\%$

$$N = 322$$

Adding 10 % for non-response rate, the final sample size was $322 + 32 = 354$

4.5.2 Sampling technique

Systematic sampling method was used, there were about 950 CT requests which full fill the inclusion criteria sent from oncologic department in the past 6th months from Dec 1, 2023 to May 30, 2024 and the sampling fraction was 950 divided by sample size (354) = 2.96 (~3), one request was selected from the first three by lottery method, then every third CT request were included.

4.6 Data collection

Data was collected by retrospectively reviewed the radiology request, radiology reports and medical records of study population with follow up CT examinations requested from oncologic clinic at st. Paul university hospital over a 6-month period from Dec 1, 2023 to May 30, 2024. The data was collected by the principal investigator

4.7 Measurements

Pretest was conducted on 5% of study subjects which are not included in the actual study, ambiguity during data collection were corrected.

4.8 Variable

4.8.1 Independent variable

Age, sex, type of primary ca, stage of the disease, requesting physician, requesting unit, anatomic scan region, clinical data and time interval from previous CT

4.8.2 Dependent variable

Level of appropriateness of follow up CT (appropriate and inappropriate)

4.9 Operational definition

Imaging appropriateness:

Requested CT that are agreed with the ACR appropriateness criteria, CT done to look complication or recurrence are considered as appropriate.

Follow up CT done in short interval (<2 months), CT without and with contrast, wrong anatomic scan region and wrong imaging are considered as inappropriate.

4.10 Inclusion criteria and Exclusion criteria

Inclusion criteria: age over 18 years; established diagnosis of malignancy; CT examination requested, no contraindications for CT including (renal failure, history of contrast reaction)

Exclusion criteria: patient with repeated follow up visit during the time period, malignancy that are not included in ACR guideline.

4.11 Data analysis and presentation

The data was collected using epi-info 7 and analyzed by Statistical Package for Social Science (SPSS) for windows version 26.0. Binary and multi-variable logistic regression analysis was done, Descriptive statistics (Frequency , percentage, mean and SD) were used, tables to depict results.

Odds ratio (OR) and P-value (P) were used to determine strength of association and to look statistical significance association

4.12 Ethical consideration

Ethical clearance was obtained from the ethical review committee of SPMMC. Ethical issues was considered in all steps of the research.

4.12 Dissemination of result

The result will be submitted to the Department of radiology and will be disseminated to SPHMMC administration and department of oncology to take actions based on research finding and it will also be present and ready for publication to journals.

5. Result

Two hundred forty-six (70.1 %) of participants were female and 106 (29.9%) were males, The mean age of participants was 46.19 ± 13.607 . The most common malignancy were breast cancer 141 (39.8%) followed by Colon / rectal cancer 69 (19.5 %) and Head and neck cancer 35 (9.8%). Anatomic scan areas presented were chest 287 (81.2%), abdomen 285 (80.5 %), pelvis 178 (50.3%) and head and neck 26 (7.3%)

Table 1: Characteristics of the patient population (n = 354) and the examinations performed.

Demographics		N	%
Age	21 - 40	138	39.0
	41 -60	161	45.5
	61 - 80	55	15.5
Sex	Male	106	29.9
	Female	246	70.1
Type of primary cancer	bladder cancer	16	4.5
	Breast Cancer	141	39.8
	esophageal cancer	33	9.3
	head and neck cancer	35	9.9
	other	30	8.5
	ovarian cancer	30	8.5
	Rectal/colonic cancer	69	19.5
Anatomical scan region	Head	26	7.3
	Neck	26	7.3
	Chest	287	81.2
	Abdomen	285	80.5
	Pelvis	178	50.3
Administration of contrast medium	with contrast	26	7.3
	both with and without contrast	315	89.0
	CT urography	5	1.4
	Chest HRCT	8	2.3
Requesting unit	oncology consultation room	110	31.1
	Gynecology oncology OPD	34	9.6
	oncology OPD 2	125	35.3
	Other	36	10.2
	surgical OPD (29 and 30)	49	13.8

Three hundred fifty-four CT request were reviewed and 315 (89%) done with and without contrast followed by with contrast only 26(7.3), Overall, only 55 (15.5 %) CT examinations were considered appropriate including both in line with ACR criteria and those CT done to look for complication. Two hundred ninety nine (84.5 %) were not considered appropriate on the basis of the information available from the medical record.

Out of the 299 imaging studies rated as inappropriate, 289 examinations were CT both with and without contrast, 19 extended to unnecessary anatomical scan region, in 70 cases the examinations were not recommended at all, (Imaging without sign and symptoms of metastasis or suspect recurrence), while 17 were wrong imaging, 13 requested by the clinician at a shorter time interval with respect to that recommended by the guidelines (less than two weeks and 4 image were taken without contrast. (The sum of these numbers exceeds the total since a few examinations were inappropriate for more than one reason)

Table 2 : level of appropriateness and cause of inappropriateness

Variables		N	%
Level of appropriateness	Not appropriate	299	84.5
	Appropriate	55	15.5
Causes of inappropriateness	CT both with and without contrast	289	81.7
	Imaging without symptoms of metastasis or suspect recurrence	70	19.8
	Wrong imaging	17	4.8
	Wrong scan area	19	5.4
	Short interval time	13	3.7
	CT without contrast	4	1.1

Binary logestic regression output shows no statistically significant difference was found in age ($p = .306$), sex ($p = .624$), no scan region or type of primary cancer presented significantly different distributions between appropriate and inappropriate examinations. The only variables significantly

associated with inappropriateness were CT scan done both with and without contrast (p=), requesting unit, (p =0.000) type of primary cancer (p =0.000) and stage of cancer (p =0.11) (table 3).

Table 3: Bivariable logistic regression output Descriptive characteristics of study population and distribution of appropriateness of CT examination

Demographics		appropriate	Not appropriate	P	COR	CI	
		N	N			Lower	Upper
Age	21 – 40	17	121	.306	.809	.539	1.214
	41 -60	29	132				
	61 – 80	9	46				
Sex	Female	37	211		1		
	Male	18	88	.624	.857	.463	1.587
Type of primary ca	Bladder	9	7				
	Breast C	6	135	.000	28.92	8.02	104.2
	Esophageal ca	9	24	.053	3.429	.982	11.96
	head and	5	30	.003	7.714	1.96	30.30
	Other	8	22	.053	3.536	.986	12.67
	Ovarian	6	24	.016	5.143	1.35	19.49
	Rectal/c	12	57	.002	6.107	1.90	19.62
contrast medium	With contrast	21	5				
	With and without contrast	28	287	.000	43.05	15.0	122.9
	CT urography	4	1	.968	1.050	.095	11.55
	Chest HRCT	2	6	.008	12.60	1.93	82.08
Stage of ca	early stage	2	4				
	late stage	20	71	.525	1.775	.303	10.40
	mid stage	15	134	.099	4.467	.754	26.46
	not know	18	90	.311	2.500	.425	14.69
Requesting unit	Oncology consultation room	7	103				
	gyn oncology opd	8	26	.007	.221	.073	.665
	Oncology opd 2	14	111	.200	.539	.209	1.388
	Other	16	20	.000	.085	.031	.233
	Surgical opd (29 and 30(	10	39	.012	.265	.094	.745

Results of the multiple logistic regression analysis partially confirmed that CT scan done both with and without contrast ($p = 0.000$) and type of primary cancer ($p = 0.000$) are significantly associated with inappropriateness at multivariate analysis Table 4.

Table 4: Multi variable logistic regression output, Descriptive characteristics of study population and distribution of appropriateness of CT examination

Demographics		Appropriate	Not appropriate	P-value	AOR	CI	
		N	N			Lower	Upper
Type of primary ca	Bladder	9	7				
	Breast C	6	135	.000	84.22	11.3	626.8
	Esophageal ca	9	24	.072	4.760	.871	26.01
	head and	5	30	.016	9.847	1.52	63.76
	Other	8	22	.153	3.306	.642	17.01
	Ovarian	6	24	.001	67.89	5.20	885.0
	Rectal/c	12	57	.047	4.868	1.02	23.16
contrast medium	With contrast	21	5				
	With and without contrast	28	287	.000	100.9	24.3	418.3
	CT urography	4	1	.044	25.03	1.08	576.3
	Chest HRCT	2	6	.001	52.29	5.16	529.3
Stage of ca	early stage	2	4				
	late stage	20	71	.989	1.018	.079	13.08
	mid stage	15	134	.945	.910	.062	13.24
	not know	18	90	.391	3.027	.241	38.00
Requesting unit	Oncology consultation room	7	103				
	gyn oncology opd	8	26	.061	.140	.018	1.093
	Oncology opd 2	14	111	.334	.570	.182	1.782
	Other	16	20	.072	.307	.085	1.109
	Surgical opd (29 and 30(	10	39	.452	.590	.149	2.334

6. Discussion

This study investigated the degree of appropriateness of CT prescribed for oncologic follow-up according to the ACR guidelines. To our knowledge, this is the first study performed in this country. In our study, two hundred forty-six (70.1 %) of participants were female and 106 (29.9%) were males, The mean age of participants was 46.19 ± 13.607 which is lower than mean age at diagnosis for Global Cancer which could be due to differences in the average age at cancer diagnosis are observed across countries (23). the most prevalent primary sites of cancer were the breast, colon and rectum, consistent with the prevalence reported in Ethiopia (1).

In the present study Almost 85 % of the CT prescribed for oncological follow-up were rated as inappropriate, which is much higher than the inappropriateness rates reported in literature for CT (14, 17, 18 and 19), this could be, this researches done on general patient which are different from oncologic patients in various perspectives like imaging sent for diagnosis rather than follow up, staging, inappropriateness rate for CT performed only for clinical indication, it is difficult to perform a direct comparison with our results due to the different guidelines used to assess appropriateness. Another research done in Italy with similar study subjects also shows difference in appropriateness level which could be they use nationally adopted guideline but, in our country, we don't have nationally adopted guideline, so we are using ACR guideline, which is not appropriate for resource scarce country, difficult in accessibility of biochemical tests to look for recurrence, bone scan and PET CT.

In our study the causes of inappropriateness were CT done both with and without contrast, extended to unnecessary anatomical scan region, images not recommended at all (Imaging without

sign and symptoms of metastasis or suspect recurrence), wrong imaging and shorter time interval, these finding in line with research done in Italy.

No statistically significant association was demonstrated for both age and gender consistent with the research results (12). CT scan done both with and without contrast are ($p = .000$), AOR of 100.9 (95% CI 24.3 - 418.3) is significantly associated with inappropriateness, which is interesting finding in this study, out of 354 patients 289 oncologic patients had CT examination both with and without contrast. For oncologic patient with confirmed diagnosis imaging for initial staging, surveillance, for distance metastasis and suspecting recurrence, CT only with contrast is usually appropriate and CT without contrast may be appropriate for some cancer but CT both with and without contrast is not recommended to decreased CT related radiation exposure (21). This is a significant number which should raise the question of the level of awareness of ACR-AC among oncology physician. Type of primary cancer e.g. for breast cancer ($p = 0.000$), AOR 84.22(95% CI 11.3 - 626.8) also shows a significant association with inappropriateness. This could be explained by the risk for recurrence or metastasis varying widely between different primary cancers and may have led to medical liability concerns and inappropriateness of follow-up between primary cancers(24, 25).

Limitations of the study

First, the retrospective nature of the study with potential unforeseen selection bias and not fully explored, the study is monocentric, which limits the generalizability of results to other hospitals. Moreover, the ACR guidelines used in this study for the appropriateness assessment which is difficult to implement in resource scarce countries like Ethiopia. Which could increase level of inappropriate. A further limitation is the lack of clinical and laboratory parameters, which may be also related to inappropriateness. Another limitation is the absence of an inter-rater agreement evaluation, which is necessary to confirm the reliability of the ratings. Additionally, the appropriateness assessment was carried out solely by radiologists. This may have led to an underestimation of the inappropriate yet justified examinations, consequently resulting in an overestimation of inappropriateness. Further studies are required to investigate these points.

7. Conclusion and recommendation

7.1. Conclusion

In conclusion, our study demonstrated that the majority of CT examinations referred for oncological follow-up were inappropriate according to the ACR guidelines, causes of inappropriateness were CT done both with and without contrast, extended to unnecessary anatomical scan region, images not recommended at all, (Imaging without sign and symptoms of metastasis or suspect recurrence), wrong imaging and shorter time interval, Statistically significant association were seen with CT scan done both with and without contrast and type of primary cancer.

7.2. Recommendation

- Implementation of clinical decision support systems, planning training courses for specific categories of physicians and creating protocols that require the physician to consult with a radiology specialist before prescribing a diagnostic
- Creating awareness on ACR guideline for oncology physician
- Adopting national guideline

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9. Assurance of Principal Investigator

I the undersigned agree to accept all responsibilities for the scientific and ethical conduct of the research project. I will provide timely progress report to my advisor and seek the necessary advice and approval from my primary advisors in the course of the research. I will communicate timely to my advisors all stakeholders involved in the study including any source of funding for this research.

Name of the student: _____

Signature: _____

Date: _____

Approval of the Primary Advisor

Name of the primary advisor: _____

Signature: _____

Date: _____

Approval of the Co-Advisor

Name of the primary advisor: _____

Signature: _____

Date: _____

Annex

Questionnaire

Questionnaire for assessment appropriateness of follow up CT on oncologic patients at SPHMMC referral hospital and to identify factors related to inappropriateness.

Part I socio-demographic profile

1. Age -----

2. Sex -----

Part II Follow up related questions

3. Scan region (check more than one answer if applicable)

a) Head

d) Abdomen

b) Neck

e) pelvis

c) Chest

4. Administration of contrast medium

a) With contrast only

b) With and without contrast

c) Without contrast only

5. Requesting unit _____

6. Level of requesting physician _____
- A. Intern
 - B. Resident (department _____)
 - C. Senior (department _____)
7. Reason of CT request/clinical date _____
- A. Initial staging
 - B. Pre neoadjuvant chemotherapy
 - C. After initiation or completion of neoadjuvant
 - D. chemotherapy Post surgical excision
 - E. Sign and symptoms of metastasis
 - F. Local recurrence
 - G. Mid cycle evaluation
 - H. End cycle evaluation
 - I. Other _____
8. Time interval from previous CT _____
9. Type of cancer _____
10. Stage of cancer with detail description _____
11. Appropriateness based on ACR appropriateness criteria.
- A. Appropriate
 - B. May be appropriate.
 - C. Not appropriate
 - D. Not applicable
12. Reason for inappropriate
- A. CT with and without contrast
 - B. CT without contrast
 - C. Wrong anatomic scan area
 - D. Short imaging interval
 - E. Wrong imaging
 - F. Follow up imaging without symptoms of metastasis or suspect recurrence
 - G. Others

