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Surgical Oncology at a Major Referral Center in Ghana: Burden, Staging, and Outcomes.

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Abstract

Background and Objectives: Outcome data after surgery for cancer in Sub-Saharan Africa is insufficient. We aimed to describe the presentation and outcomes of patients with solid cancers managed at a tertiary hospital in Ghana.

Methods: Records of cancer patients admitted to Komfo Anokye Teaching Hospital general surgery wards from 2013–2016 were reviewed for data on presentation, staging, management, and mortality. Patients discharged alive were followed-up by biannual telephone calls to establish their post-discharge status. Survival analysis was performed for patients with pathologic or radiologic confirmation of cancer and adequate staging.

Results: 343 patients were included. 76% were female. Most common diagnoses were breast 136(40%), foregut 70(20%) and colorectal 63(18%) cancers. Cancer diagnosis was confirmed by pathology or radiology in 281(82%) patients, but only 112(40%) had adequate staging. Seventy-four (66%) patients were stage IV. Two-year overall survival for all 343 patients was 22–69%,

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Acquisition, analysis, or interpretation of data: All Authors

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Conflict of Interests

None

depending on cancer site. Among those with adequate staging who were alive after post-operative 90 days, 3-year survival was similar for curative compared to palliative operations ($p=0.64$).

Conclusions: Improved capacity for both therapeutic and palliative cancer care are needed in order to achieve better outcomes by more appropriate allocation of surgery with respect to goal of treatment.

Keywords

Cancer staging; Cancer management; Cancer outcomes; Ghana; LMIC; Cancer; Surgery; Low- and middle-income countries; Outcomes

Introduction

Cancer is the second most common cause of death worldwide, accounting for 15.7% of all-cause mortality.¹ Historically, the burden of cancer has been overshadowed in developing countries by infectious and neonatal mortality, however with increasing life expectancy, urbanization, and adoption of western lifestyles, the global burden of cancer has shifted towards low- and middle-income countries (LMICs).² By 2030, the World Health Organization estimates 60% of all new cancer cases will occur in LMICs.^{3,4} Cancer care is complex, requiring infrastructure to support surgeons, anesthesiologists, pathologists, chemotherapy and radiation therapies. This complexity often exceeds the abilities of less developed health care systems, evident in that the overall case fatality rate of cancer is estimated to be 75% in LMICs, compared to 46% in high income countries.⁴⁻⁷

Surgical intervention is essential to providing care for most cancer patients.⁸⁻¹⁰ A surgeon may be needed to provide any combination of diagnostic or staging biopsies, curative resection, or palliative operations in the care of patients.¹¹ Efforts are ongoing to foster research, education, and advocacy to increase awareness of cancer in sub-Saharan Africa (SSA), and other LMICs more broadly.¹²⁻¹⁴ Despite this, the burden of cancer in SSA remain poorly described and accurate data on the occurrence and treatment of cancer and surgical outcomes remains insufficient.¹⁵

In Ghana, cancer-related disease currently is the fourth leading cause of death, resulting in 58 deaths per 100,000 people annually, and accounts for 8.3% of all-cause mortality.¹ This represents a 6.1% increase over the past decade and is the only cause that is worsening among the top five causes of death in Ghana.¹ We sought to describe the burden of cancer presenting to a major tertiary hospital in Ghana, including information on cancer site, staging, treatments administered, and survival.

Methods

Participants/ Setting

Ghana is a LMIC country in SSA with a population of 27 million.¹⁶ Komfo Anokye Teaching Hospital (KATH) is the country's second largest referral hospital that offers, among other services, specialist care to patients with cancer. Patients presenting to the general surgical wards of KATH from May 2013 onward with a clinical diagnosis of cancer

were enrolled in a pilot database. Enrolled patients were observed throughout the process of care. Patient enrollment and follow-up through October 2016 were included in our analysis.

Data Collection

Details of presentation, patient demographics, clinical examination, radiology reports, operative reports, including treatment intent (palliative versus curative), and pathology reports were recorded from patient medical records. Diagnosis of cancer was confirmed by pathology reports when available. Patients without a tissue-based diagnosis but with radiology findings demonstrating high suspicion for malignancy (especially in difficult to biopsy areas; e.g., pancreas) were also included. Staging was determined utilizing data from pathology reports, supplemented with radiologic and clinical reports, including operative notes. Following discharge from hospital, patients were contacted every 6 months by phone to ascertain details regarding additional other treatments (e.g. chemotherapy, radiotherapy, hormonal therapy, etc. whether intended as neoadjuvant, adjuvant, or standalone therapy), health status (e.g. cancer relapses, complications, additional hospitalizations), and survival. If patients had died in the interim period, information including additional treatments undertaken and date of death were gathered from family members. All identifiable patient information (e.g. patient names, folder numbers) were coded in the database and de-identified before analysis.

Analysis

Subgroup analysis was performed for patients that had pathologic or radiologic confirmation of cancer with adequate staging (Figure 1). Data were expressed as descriptive statistics. Kaplan-Meier survival analysis was completed using the last known date alive for patients. Survival analysis was carried out to the extent of the available data. Log rank testing was used to compare Kaplan-Meier survival curves. Multivariate survival analysis was completed with Cox proportional hazard testing to determine a difference between patients undergoing surgery with curative or palliative intent. Patient age, cancer site, cancer stage and other therapies patients received were co-variables that were included *a priori* in the multivariate analysis. All analysis was completed using Stata v14.2 (StataCorp, College Station TX). P-values less than 0.05 were considered significant. The study was approved by the Kwame Nkrumah University of Science and Technology Committee of Human Research, Publications, and Ethics.

Results

Three hundred seventy-one patients had been enrolled in the database by the time of analysis. Twenty-eight were excluded from further analysis due to incomplete demographic or presentation data, leaving a total of 343 patients for further description. Median age of participants was 54 years (range 14–92), and a large majority were female (259, 76%). Breast cancer was the most common cancer type, constituting 40% of the patients. This was followed by foregut cancers (esophagus, stomach, and duodenal, 20%) and colorectal cancers (18%) (Table 1). Survival analysis of all presenting patients by suspected cancer type reveals two-year overall survivals of 69% for breast, 50% for endocrine, 48% for skin/soft tissue, 58% for anal, 45% for foregut, 38% for colorectal, 33% for retroperitoneal, and

22% for HPB cancers. The respective rates were maintained at three years for breast, foregut, and colorectal cancers – cancers for which three-year overall survival rates were available. (Figure 2).

A diagnosis of cancer was confirmed by pathology or radiology in 281 (82%) patients; 219 (78%) with a tissue pathology based diagnosis via either surgical specimen or biopsy. Pathology was most commonly available for breast (97; 89%), anal (10; 91%), and skin/soft tissue (18; 95%) malignancies. Radiology was the basis of diagnosis in 22% of cases where it provided evidence of advanced stage disease. Majority of HPB malignancies (21/31) were diagnosed this way (Table 1). Of the 281 patients with a confirmed diagnosis of cancer, sufficient pathology and/or radiologic information for adequate staging was available for only 112 (40%) patients. Overall, 74 (66%) patients presented with Stage IV and 21 (19%) with Stage III disease. Stage IV disease comprised the majority of presentation across each individual cancer type, with the second most common being stage III in breast (18; 32%) and colorectal (2; 8%) and stage II in foregut (3; 23%) (Table 2).

Of the 112 patients with adequate staging, 79 (71%) patients underwent some form of treatment for their cancer (surgery, chemotherapy, radiation, and/or hormonal therapy), while 33 (34%) did not receive treatment. Seventy-four (66%) patients underwent surgery; of these 39 underwent a primary operation with curative intent and 27 a palliative operation. Thirty-eight (34%) patients received other therapies, including any combination of radiation, chemo, or hormonal therapy whether intended as neoadjuvant, adjuvant, or standalone therapy (Table 2).

Over half (20/39) of the patients who underwent operation with curative intent had stage III disease, with an additional three (8%) and 10 (26%) having Stage I and II disease, respectively. Six patients (15%) had Stage IV disease and underwent surgery with curative intent. Of these four had colorectal cancer, and two had breast cancer. Twenty-seven patients underwent a palliative operation (e.g. diverting colostomy for colorectal cancer, toilet mastectomy for breast cancer, biliary drainage procedures for pancreatic cancer). Almost all (26; 96%) had stage IV disease. Only one breast cancer patient with stage III disease received a palliative operation. She presented with a fungating breast mass with 3×2 cm necrotic ulcer who underwent toilet mastectomy. The histologic diagnosis was a T4bN1M0 grade 3 invasive ductal carcinoma.

Among patients with adequate staging who were alive after post-operative 90 days, survival for those who underwent curative surgery was 91% (95% CI: 74% – 97%) at 182 days, 69% (95% CI: 50% – 82%) at 1 year, and 69% (95% CI: 50% – 82%) at 3 years. Corresponding survival for patients who underwent palliative surgery was 92% (95% CI: 56% – 99%), 84% (95% CI: 49% – 96%) and 63% (95% CI: 28% – 65%) respectively. Survival analysis comparing patients who underwent curative versus palliative operations did not show any difference in survival between the two groups ($p=0.64$) (Figure 3). Additionally, after controlling for age, cancer type, staging, and use of other therapies, having a curative operation was not associated with better survival compared to undergoing palliative procedures (Adjusted Hazard Ratio 1.64; 95%CI: 0.30 – 9.02, $p=0.57$)

Of the 169 patients with pathologic or radiologic confirmation of cancer but without complete staging, 49 (29%) did not receive treatment. One hundred and twenty (71%) patients underwent treatment for their cancer, all of whom underwent surgery; 84 (70%) with curative intent and 22 (18%) for palliative reasons. Their overall 30-day, 90-day and 2-year survival rates were 90%, 80% and 62% respectively.

Sixty-two patients only had a clinical diagnosis of cancer without pathologic or radiologic confirmation. Fourteen underwent surgery, 12 of which were with palliative intent. 30-day, 90-day and 2-year overall survival rates for the entire group were 54%, 46% and 33% respectively.

Discussion

Cancer is a leading cause of death and is quickly becoming a major public health crisis in LMICs.^{1,11} The World Health Organization estimates that 846,900 new cases of cancer occur annually in Africa and that 20% of surgery in LMICs is now used to treat cancer.¹⁵ Surgical care is essential to cancer diagnosis, treatment, and palliation, however poor access to specialized oncology surgery remains a major obstacle to cancer care in these regions.^{7–10,17} In addition to quantifying the burden of surgical oncology, it is essential to monitor outcomes to identify deficits and develop benchmarks aimed at reducing the disease burden. The importance of databases in the progression of cancer care is now universally recognized, with over 25 developed registries in 20 SSA countries.^{18,19} Additionally, the World Health Organization (WHO) has dedicated specific attention to estimating cancer incidence and mortality with GLOBOCAN,²⁰ however little attention has been paid to cataloging outcomes specific to cancers amenable to surgery.

Our findings demonstrate a substantial burden of cancer patients in Ghana requiring general surgery admission. Similar to other reports in the literature from SSA, the most common cancer types seen here were breast, colorectal, and foregut.^{21–23} Majority of all admitted patients went on to undergo surgery (208, 61%) which is slightly higher than rates previously reported from Rwanda, where 46% of patients presenting for surgical evaluation underwent an operation.²⁴ Additionally, most patients in our study who underwent surgery did so with curative intent (124, 60%). This differs from accounts in Malawi where, apart from breast operations, 70–94% of cancer procedures were with palliative intent.²² These findings may be a reflection of the need for building cancer-specific surgical capacity aimed at improving outcomes for the increasing number of cancer patients in SSA. They may also be the consequence of the often documented late-stage presentation among cancer patients in SSA.^{25–29}

Adequate staging was available for only 40% of patients who had a tissue or radiologically confirmed diagnosis of cancer. This is consistent or better than reports from other SSA countries like Uganda, The Gambia, and Malawi;^{11,23,30,31} however it is less than the 50% reported from Pakistan, another LMIC country.³² Our staging practices were overall insufficient, resulting in uncertainty of staging for a large number of patients. This might have ultimately hindered accurate surgical decision making. Adequate staging is critical to inform cancer care; however, it requires a host of expensive consumable materials, specific

infrastructure (e.g. consistent refrigeration, lab equipment, CT/PET scanners), and specialized human resources (pathologists, diagnostic radiologists, nuclear medicine physicians etc) often not readily accessible to many LMIC patients.^{11,14} These challenges in providing adequate staging information are especially acute in SSA, hindering appropriate allocation of treatment and ultimately worsening patient outcomes.^{6,24,33}

Depending on the cancer site, overall 2-year survival ranged from 22–69%. For patients with adequate staging who underwent surgery, a high 90-day post-operative mortality was observed (12% for patients undergoing curative surgery vs 41% for those undergoing palliative operations). For those who were alive after post-operative 90 days, analysis did not show any statistical association regarding survival for patients receiving curative surgeries over those receiving palliative operations. This high early post-operative mortality is possibly the result of surgeons taking heroic steps for patients presenting in late stage, sick, and seeking a last hope for relief. However, this questions the use of surgical resources in this scenario, perhaps indicating the need for improved pre-operative optimization or consideration of other end-of-life care measures. The expected outcome of surgery performed for cancer largely depends on administration of the appropriate procedure in regards to goal of treatment. Although cancer stage is not the only determinant of treatment options, it is the key determinant of the management strategy.³⁴ The sensitivity of the imaging modality used in the process of screening for distant metastasis in a non-symptomatic patient cannot be overemphasized.^{35,36} In Ghana, X-ray and ultrasonography are the image modalities heavily relied upon to determine distant metastasis.^{37,38} From our findings, it is likely that survival of curative-intent operations may have been in-part hindered by patients with worse-stage disease than initially diagnosed. Inadequate surgical proficiency might have also played a role in patients receiving palliative procedures when their cancer stage would rather benefit from curative surgeries. Overall mortality was also hindered by the overwhelming proportion of late stage presentations (66% of patients who had adequate staging had Stage IV disease), and efforts to improve timeliness of presentation and identify early stage patients will be a key component to improving surgical oncology outcomes.

Cancer survival also depends on the use chemotherapy, radiation, and/or hormonal therapy when appropriate. These adjuvant therapies are not widely available in LMICs, Ghana included, as demonstrated by use in only 34% of the patients in our study.^{6,39,40}

Chemotherapy and hormone therapy is available in Ghana but is only accessible to patients with breast or cervical cancer, who can receive it at no cost under the National Health Insurance Scheme (NHIS). For out-of-stock NHIS-approved drugs and for all non NHIS-approved drugs, cancer patients are required to purchase out-of-pocket; but these drugs are largely unaffordable and hence inaccessible. A previous study reported that as much as 86% of cancer patients at KATH were unable to complete adjuvant treatments without interruption and/or defaulting from treatment.⁴¹ After adjusting for the effect of other therapies in our survival analysis, no difference in overall survival was shown between patients who received curative surgeries and those who underwent palliative procedures.

Prior to drawing conclusions from these results, several additional limitations deserve discussion. Firstly, data collection on patient survival and other treatment was completed

through patient interviews. This exposes the results to potential for bias. However, inaccuracies in reporting of date of death would likely be random and not significantly affect the results. Secondly, many patients were lost to follow up which made following of their survival to later time points impossible. While this was managed in our analysis, it introduces some weakness in our statements regarding longer-term survival. Third, our data was limited to only patients admitted to the general surgery wards and did not include those who might have attended outpatient clinics nor did it include the large burden of other operable cancers (e.g., cervical, prostate) known to be leading causes of cancer death in LMICs. Fourth, Since the study was restricted to patients who had been admitted to the hospital, our data may have captured more women who have been reported to have better health seeking behavior than men, especially when access is possible at government health facilities (such as KATH) under the NHIS.^{42,43} A similar trend was reported from Accra that found more women presenting to the hospital and dying from HPB, colorectal and breast cancers.⁴⁴

Conclusions

Cancer is a leading cause of death, with worsening burdens in LMICs. Our observation of no survival difference among patients irrespective of operative intent highlights the need to improve cancer-specific surgical capacity and operative outcomes in LMICs, specifically in regards to appropriate allocation of surgery. Additionally, better staging and outcomes data are needed to provide baseline information needed to guide cancer care efforts in these regions.

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References

1. Institute for Health Metrics and Evaluation. Data Visualizations. Global Burden of Disease Cause Patterns 2016; <http://vizhub.healthdata.org/gbd-cause-patterns/> Accessed February 10, 2018.
2. Torre LA, Siegel RL, Ward EM, Jemal A. Global Cancer Incidence and Mortality Rates and Trends--An Update. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology.* 2016;25(1):16–27.
3. Kachroo S, Etzel CJ. Decreasing the cancer burden in developing countries: concerns and recommendations. *Eur J Cancer Care (Engl).* 2009;18(1):18–21. [PubMed: 19473221]
4. Farmer P, Frenk J, Knaul FM, et al. Expansion of cancer care and control in countries of low and middle income: a call to action. *Lancet.* 2010;376(9747):1186–1193. [PubMed: 20709386]
5. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. *International journal of cancer Journal international du cancer.* 2010;127(12):2893–2917. [PubMed: 21351269]
6. de Souza JA, Hunt B, Asirwa FC, Adebamowo C, Lopes G. Global Health Equity: Cancer Care Outcome Disparities in High-, Middle-, and Low-Income Countries. *Journal of clinical oncology :*

official journal of the American Society of Clinical Oncology. 2016;34(1):6–13. [PubMed: 26578608]

7. Price AJ, Ndom P, Atenguena E, Mambou Nouemssi JP, Ryder RW. Cancer care challenges in developing countries. *Cancer*. 2012;118(14):3627–3635. [PubMed: 22223050]
8. Gyorki DE, Muyco A, Kushner AL, Brennan MF, Kingham TP. Cancer surgery in low-income countries: an unmet need. *Archives of surgery*. 2012;147(12):1135–1140. [PubMed: 23248017]
9. Hoekstra HJ, Wobbes T, Heineman E, Haryono S, Aryandono T, Balch CM. Fighting Global Disparities in Cancer Care: A Surgical Oncology View. *Ann Surg Oncol*. 2016;23(7):2131–2136. [PubMed: 27038459]
10. Zogg CK. Recognition of surgical need as part of cancer control in Africa. *The lancet oncology*. 2013;14:e289.
11. Kingham TP, Alatisse OI, Vanderpuye V, et al. Treatment of cancer in sub-Saharan Africa. *The lancet oncology*. 2013;14(4):e158–167. [PubMed: 23561747]
12. Stefan DC, Elzawawy AM, Khaled HM, et al. Developing cancer control plans in Africa: examples from five countries. *The lancet oncology*. 2013;14(4):e189–195. [PubMed: 23561751]
13. Stulac S, Binagwaho A, Tapela NM, et al. Capacity building for oncology programmes in sub-Saharan Africa: the Rwanda experience. *The lancet oncology*. 2015;16(8):e405–413. [PubMed: 26248848]
14. Sullivan R, Alatisse OI, Anderson BO, et al. Global cancer surgery: delivering safe, affordable, and timely cancer surgery. *The lancet oncology*. 2015;16(11):1193–1224. [PubMed: 26427363]
15. Ferlay J, Soerjomataram I, Dikshit R, et al. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. *International journal of cancer Journal international du cancer*. 2015;136(5):E359–386. [PubMed: 25220842]
16. CIA World Factbook. Ghana 2018; <https://www.cia.gov/library/publications/resources/the-world-factbook/geos/gh.html> Accessed April 11th, 2018.
17. Daphtary M, Agrawal S, Vikram B. Human resources for cancer control in uttar pradesh, India: a case study for low and middle income countries. *Front Oncol*. 2014;4:237. [PubMed: 25237650]
18. Jedy-Agba EE, Oga EA, Odutola M, et al. Developing National Cancer Registration in Developing Countries - Case Study of the Nigerian National System of Cancer Registries. *Front Public Health*. 2015;3:186. [PubMed: 26284233]
19. Singh E, Ruff P, Babb C, et al. Establishment of a cancer surveillance programme: the South African experience. *The lancet oncology*. 2015;16(8):e414–421. [PubMed: 26248849]
20. International Agency for Research on Cancer. The Globocan Project. 2012; <http://globocan.iarc.fr/Default.aspx> Accessed 12 April, 2018.
21. Akinde OR, Phillips AA, Oguntunde OA, Afolayan OM. Cancer mortality pattern in lagos university teaching hospital, lagos, Nigeria. *J Cancer Epidemiol*. 2015;2015:842032. [PubMed: 25628656]
22. Kendig CE, Samuel JC, Tyson AF, et al. Cancer Treatment in Malawi: A Disease of Palliation. *World J Oncol*. 2013;4(3):142–146. [PubMed: 24058389]
23. Msyamboza KP, Manda G, Tembo B, et al. Cancer survival in Malawi: a retrospective cohort study. *The Pan African medical journal*. 2014;19:234. [PubMed: 25838862]
24. Mubiligi JM, Hedt-Gauthier B, Mpunga T, et al. Caring for patients with surgically resectable cancers: experience from a specialised centre in rural Rwanda. *Public Health Action*. 2014;4(2):128–132. [PubMed: 26399213]
25. Nartey Y, Hill PC, Amo-Antwi K, Nyarko KM, Yarney J, Cox B. Cervical Cancer in the Greater Accra and Ashanti Regions of Ghana. *Journal of Global Oncology*. 2017;3(6):782–790. [PubMed: 29244993]
26. Ohene-Yeboah M, Adjei E. Breast cancer in Kumasi, Ghana. *Ghana Med J*. 2012;46(1):8–13. [PubMed: 22605883]
27. Clegg-Lamprey J, Dakubo J, Attobra YN. Why do breast cancer patients report late or abscond during treatment in ghana? A pilot study. *Ghana Med J*. 2009;43(3):127–131. [PubMed: 20126325]

28. Agyemang-Yeboah F, Yorke J, Obirikorang C, et al. Patterns and presentations of colorectal cancer at Komfo-Anokye teaching hospital Kumasi, Ghana. *The Pan African medical journal*. 2017;28:121. [PubMed: 29515739]
29. Gyedu A, Shrauner WR, Kingham TP. No patients to resect or transplant: an analysis of patients with hepatocellular carcinoma admitted to a major African referral hospital. *World journal of surgery*. 2015;39(1):231–236. [PubMed: 25167899]
30. Shimakawa Y, Bah E, Wild CP, Hall AJ. Evaluation of data quality at the Gambia national cancer registry. *International journal of cancer Journal international du cancer*. 2013;132(3):658–665. [PubMed: 22618962]
31. Wabinga HR, Parkin DM, Wabwire-Mangen F, Nambooz S. Trends in cancer incidence in Kyadondo County, Uganda, 1960–1997. *British journal of cancer*. 2000;82(9):1585–1592. [PubMed: 10789729]
32. Bhurgri Y, Bhurgri A, Pervez S, et al. Cancer profile of Hyderabad, Pakistan 1998–2002. *Asian Pacific journal of cancer prevention : APJCP*. 2005;6(4):474–480. [PubMed: 16435995]
33. Anderson BO, Yip CH, Smith RA, et al. Guideline implementation for breast healthcare in low-income and middle-income countries: overview of the Breast Health Global Initiative Global Summit 2007. *Cancer*. 2008;113(8 Suppl):2221–2243. [PubMed: 18816619]
34. Bruening W, Sullivan R, Paulson EC, et al. Imaging tests for the staging of colorectal cancer In. *Effective Health Care Program: Comparative Effectiveness Review*. Pennsylvania 2014.
35. Schueller G, Herold CJ. Lung metastases. *Cancer Imaging*. 2003;3(2):126–128.
36. Robinson P The early detection of liver metastases. *Cancer Imaging*. 2002;2(2):1–3.
37. Clegg-Lamprey J, Hodasi W. A Study of Breast Cancer in Korle Bu Teaching Hospital: Assessing the Impact of Health Education. *Ghana Med J*. 2007;41(2):72–77. [PubMed: 17925846]
38. Essuman V, Ntim-Amponsah CT, Akafo S, Renner L, Edusei L. Presentation of Retinoblastoma at a Paediatric Eye Clinic in Ghana. *Ghana Med J*. 2010;44(1):10–15. [PubMed: 21326985]
39. Gelband H, Sankaranarayanan R, Gauvreau CL, et al. Costs, affordability, and feasibility of an essential package of cancer control interventions in low-income and middle-income countries: key messages from Disease Control Priorities, 3rd edition. *Lancet*. 2016;387(10033):2133–2144. [PubMed: 26578033]
40. Pesec M, Sherertz T. Global health from a cancer care perspective. (1744–8301 (Electronic)).
41. Scherber S, Soliman AS, Awuah B, et al. Characterizing breast cancer treatment pathways in Kumasi, Ghana from onset of symptoms to final outcome: outlook towards cancer control. *Breast disease*. 2014;34(4):139–149. [PubMed: 24934170]
42. Bertakis K, Azari R, Helms L, Callahan E, JA R. Gender differences in the utilization of health care services. *Journal of Family Practice* 2000;49(2):147–152. [PubMed: 10718692]
43. Mensah J, Asamoah D, AK T. Optimizing patient flow and resource utilization in outpatient clinic: a comparative study of Nkawie Government Hospital and Aniwaa Health Centre. *Journal of Applied Business and Economics*. 2014;16(3):181–188.
44. Wiredu EK, Armah HB. Cancer mortality patterns in Ghana: a 10-year review of autopsies and hospital mortality. *BMC public health*. 2006;6:159–165. [PubMed: 16787544]

Synopsis for Table of Contents:

We describe the presentation and outcomes of patients with solid cancers managed at a tertiary hospital in Ghana. Only 40% of patients with confirmed cancer diagnosis had adequate staging, among whom overall 3-year post-operative survival was similar irrespective of operative intent.

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Figure 1.
Description of patients.

Figure 2. Overall survival from initial presentation by cancer site.

Hash marks indicate points of censorship, due to participants being lost to follow up.

Figure 3: Survival after post-operative 90 days by operative intent among patients with adequate staging.

Hash marks indicate points of censorship, due to participants being lost to follow up.

Table 1.**Demographics, diagnosis, and treatment by cancer type.**

HPB: Hepato-Pancreatico-Biliary, SST: Skin and Soft Tissue, RP: Retroperitoneal.

	Total	Breast	Colorectal	HPB	Foregut	Anal	SST	RP	Endocrine
Patients, N (%)	343 (100)	136 (40)	63 (18)	36 (11)	70 (20)	11 (3.2)	19 (5.5)	6 (1.8)	2 (0.6)
Female, N (%)	259 (76)	136 (100)	38 (60)	25 (69)	32 (46)	8 (73)	13 (68)	5 (83)	2 (100)
Age Median (Range), years	54 (14–92)	48 (16–80)	56 (23–84)	62 (38–85)	63 (28–92)	62 (25–83)	46 (14–70)	55 (45–59)	73 (66–79)
Diagnosis confirmed	281	109	54	31	51	11	19	4	2
By Pathology	219	97	41	10	40	10	18	2	1
By Radiology	62	12	13	21	11	1	1	2	1
Surgery	208	89	35	18	38	10	14	3	1
Curative Surgery	124	73	24	0	12	2	12	0	1
Palliative Surgery	61	16	8	13	21	0	1	2	0
Staging/ Biopsies	23	0	3	5	5	8	1	1	0
Other Therapy	88	60	10	0	8	3	3	3	1

HPB: Hepatic-Pancreatic-Biliary, SST: Skin and Soft Tissue, RP: Retroperitoneal. Other therapy: any combination of chemotherapy, radiation, or hormonal therapy as stand alone, neoadjuvant, or adjuvant therapy.

Table 2.**Stage and treatment for patients with confirmed cancer diagnosis.**

HPB: Hepato-Pancreatico-Biliary, SST: Skin and Soft Tissue, RP: Retroperitoneal.

	Total	Breast	Colorectal	HPB	Foregut	Anal	SST	RP	Endocrine
Diagnosis confirmed, N (%)	281 (100)	109 (100)	54 (100)	31 (100)	51 (100)	11 (100)	19 (100)	4 (100)	2 (100)
Staging complete, N (%)	112 (40%)	56 (51%)	24 (44%)	14 (45%)	13 (25%)	1 (9.1%)	1 (5.3%)	3 (75%)	0 (0%)
Stage I	5	1	0	2	2	0	0	0	-
Stage II	12	8	0	1	3	0	0	0	-
Stage III	21	18	2	0	1	0	0	0	-
Stage IV	74	29	22	11	7	1	1	3	-
Surgery	74	38	14	8	11	0	1	2	-
Curative Surgery	39	27	6	0	6	0	0	0	-
Palliative Surgery	27	11	6	5	3	0	0	2	-
Staging/ Biopsies	8	0	2	3	2	0	1	0	-
Other Therapy	38	28	6	0	3	0	0	1	-

Notes: HPB: Hepatic-Pancreatic-Biliary, SST: Skin and Soft Tissue, RP: Retroperitoneal. Other therapy: any combination of chemotherapy, radiation, or hormonal therapy as stand alone, neoadjuvant, or adjuvant therapy.