Research Report

Predictors of follow-up non-compliance after definitive radiotherapy for locally advanced cervical cancer at a community cancer center

Lucas G. Sapienza a,b,*, Justin J. Thomas a,b, Alfredo E. Echeverria a,b, Shelly Sharma a,b, Daniel A. Hamstra a,b, Tracilyn R. Hall c, Michelle S. Ludwig a,b

a Department of Radiation Oncology, Dan L. Duncan Comprehensive Cancer Center, Baylor College of Medicine, Houston, TX, USA
b Department of Radiation Oncology, Smith Clinic – J. Evans and Mary P. Atwell Radiation Therapy Center – Harris Health System, Baylor College of Medicine, Houston, TX, USA
c Department of Obstetrics and Gynecology, Division of Gynecologic Oncology, Dan L. Duncan Comprehensive Cancer Center, Baylor College of Medicine, Houston, TX, USA

ARTICLE INFO

Keywords:
Cervical cancer
Radiotherapy
Surveillance
Follow-up
Financial toxicity

ABSTRACT

Introduction: Non-compliance to post-treatment cancer surveillance can lead to late detection of recurrence. This study aims to identify patients at high risk for loss of follow-up after radiotherapy for locally advanced cervical cancer.

Methods: Consecutive patients with locally advanced cervical cancer treated with definitive chemoradiotherapy (2013–2020) at a community cancer center were retrospectively reviewed. The main outcome was overall follow-up compliance rate over time. Additionally, specialist-specific follow-up times, reasons for discontinuation and predictors of loss of follow-up events were evaluated.

Results: The median age of the 154 patients included was 46.5 years (range: 26–84). The 6-month, 1-, 3-, and 5-year overall loss of follow-up rates were: 5.3%, 15.3%, 33.6%, and 48.2%, respectively. After a median overall follow-up time of 21.0 months, the median specialist-specific surveillance times were 17 months and 6 months with gynecologic and radiation oncologists, respectively (p < 0.01). Overall, the most common reasons for loss of follow-up were financial (21.7%) and relocation to another city (28.3%). By specialty, the most common reasons were relocation of care (56.5%, gynecologic oncologist) and disease progression (31.3%, radiation oncologist). In the multivariable analysis, older age (continuous, OR: 0.96; p < 0.01) and Hispanic ethnicity (OR: 0.39; p < 0.01) were protective against loss of follow-up, while increased number of gestations (continuous, OR: 1.23, p = 0.01) and living farther from the cancer center (continuous, OR: 1.002; p = 0.03) increased the chance of loss of follow-up.

Conclusion: Younger, non-Hispanic, multiparous women that live far from the community cancer center have an increased chance of follow-up discontinuity, which are attributed to financial reasons in more than 20% of the cases.

1. Introduction

Post-treatment cancer surveillance is crucial for the diagnosis of recurrence and management of possible iatrogenic sequelae. In the setting of locally advanced cervical cancer, delayed detection of locoregional disease relapse or actinic side-effects, such as fistulas and bowel obstructions, may result in pelvic exenteration (Baiocchi et al., 2013) and compromised prognosis (Lawhead et al., 1989; Miller et al., 1993).

Current guidelines (Salani et al., 2017; National Comprehensive Cancer Network, 2021) recommend periodic evaluations after definitive chemoradiotherapy every 3–6 months for 2 years, every 6–12 months for another 3 to 5 years, and then annually. Although cost-effective from the health system perspective, compliance with these multiple specialist visits results in direct and indirect costs to the patient.

Since cervical cancer diagnosis is associated with low-socioeconomic status in both developed and developing countries (Sung et al., 2021; Booth et al., 2010), it could be hypothesized that, among other reasons,
financial toxicity may negatively impact follow-up compliance of these patients. Although some previous studies detected a high rate of post-treatment surveillance discontinuity for patients with advanced cervical cancer (Mandal, 2000; Zamorano et al., 2019), no study has examined in detail the factors associated with follow-up non-compliance.

The present study aims to estimate the rate of surveillance compliance over time after definitive treatment for locally advanced cervical cancer, as well as to evaluate factors associated with discontinuity to potentially detect a subgroup of patients at higher risk for loss of follow-up. Secondly, we evaluated the specialist-specific surveillance (gynecologic oncologist and radiation oncologist).

2. Methods

2.1. Study design

All patients with a diagnosis of locally advanced cervical cancer referred to the radiation oncology department between May 2013 and October 2020 were identified. The department is part of a largely publicly funded safety net health system that serves as a community cancer center for many patients who do not have private insurance. Inclusion criteria were: (1) newly diagnosed primary cervical cancer; (2) non-metastatic disease (stages IB-IVA); (3) radiotherapy boost performed with high dose rate brachytherapy; and (4) both teletherapy and brachytherapy performed at our institution. Cases with small/large cell neuroendocrine and sarcoma histologies were excluded (n = 4). The case selection diagram is presented in Supplementary Fig. S1 (total patients included: 154). The institutional review board (IRB) approved this study design and waived the need for informed consent given the use of de-identified individual patient information (IRB number H-44995).

2.2. Treatment protocol

External beam radiotherapy consisted of 45–50.4 Gy (25–28 daily fractions of 1.8–2.0 Gy) delivered to the uterus, vagina, parametrium and prophylactic drainage (common iliac, pre-sacral and internal/external iliac). Para-aortic nodes were therapeutically irradiated for all patients with radiologic suspicious nodes in that region and prophylactically for some patients with positive pelvic nodes at the discretion of the radiation oncologist. For patients with tumors extending to the middle-lower vaginal wall, the bilateral inguinal nodal areas were included based on physician preference. Additional radiation dose to the positive nodes was performed via sequential or simultaneous integrated boost. Brachytherapy was delivered with either an intracavitary (tandem and ovoids) or interstitial (Syed applicator) technique, following the ‘Image-guided intensity modulated external beam radiotherapy and MRI based adaptive brachytherapy in locally advanced cervical cancer’ (EMBRACE) prescription and dose constraint recommendations (Potter et al., 2006; EMBRACE, 2021). Concurrent chemotherapy consisted of weekly cisplatin (40 mg/m²) and was managed by the gynecologic oncologist.

2.3. Endpoints

The main study outcome was overall follow-up compliance rate over time. The surveillance protocol at our institution included evaluations after definitive chemoradiotherapy every 3–6 months for 2 years, every 6–12 months for another 3 to 5 years, and then annually. A loss of follow-up event was defined after 3 months without any medical visit performed and no subsequent visit scheduled (backdated to the day of the last visit). The end of radiotherapy was set as initial time (T0). Secondary outcomes consisted of specialist-specific surveillance over time, based on compliance with post-treatment visits with the gynecologic oncologist and the radiation oncologist. The sex of the attending physician that performed the initial consult (radiation oncology, gynecologic oncology) was used in the subgroup analyses. Additionally, we performed a descriptive analysis of the reasons for follow-up discontinuity. The reasons were classified as: (I) financial reasons and (II) due to patient moving residency out of the catchment area or seeking care at another institution. When available, the last notes recorded by the medical team and the social workers in the electronic medical system were evaluated to extract the reason for the loss of follow-up event. Only explicit descriptions of the reason were considered for classification (e.g., “patient will continue care at another institution” = moved care; “patient wasn’t able to renew the insurance” = financial reason). Otherwise, the reason was labelled as not disclosed.

2.4. Statistical analysis

The initial analysis of overall loss of follow-up was performed using univariate Cox regression (Cox, 1972). Variables with p < 0.25 were then incorporated into the multivariate Cox proportional-hazards model. Normality of the follow-up time per specialist was initially analyzed with Kolmogorov-Smirnov test (Smirnov, 1948). Because the specialists’ follow-up data followed a non-normal distribution, the comparison of these paired means was performed using the related-samples Wilcoxon signed rank test (Wilcoxon, 1945). Endpoints were represented via the Kaplan-Meier method (Kaplan and Meier, 1958), with patient death or hospice admission included as censoring events. All statistical analyses were performed using IBM SPSS Statistics, Build 29.0.0.15080, Armonk, NY, USA. Graphic representations of the reasons for loss of follow-up were presented in figure format via Numbers software (Apple, Cupertino, CA).

3. Results

3.1. Patient and treatment characteristics

The median age of the 154 patients was 46.5 years (range: 26–84). Regarding demographic characteristics, 54.5% were Hispanic, 48.1% were single and median distance from patient residency to the cancer center was 16.5 miles (range: 0.6–1552). Thirty-seven percent were ECOG (Eastern Cooperative Oncology Group) performance status zero. The predominant histology was squamous cell carcinoma (85.7%). The FIGO staging was I/II and III/IVA in 24% and 76% of patients, respectively.

All patients received planned brachytherapy boost (95 intracavitary and 59 interstitial) after external beam radiotherapy and 98.7% received concurrent platinum-based chemotherapy. More characteristics are presented in Table 1 and Supplementary Table S1.

3.2. Follow-up compliance

The median overall follow-up time was 21.0 months (range: 1–84). The 6-month, 1-, 3-, and 5-year overall loss of follow-up rates were: 5.3%, 15.3%, 33.6%, and 48.2%, respectively. The median surveillance times with the gynecologic and radiation oncologists were 17 months (mean 22.0 months) and 6 months (mean 10.2 months), respectively (p < 0.01) (Fig. 1). The factors associated with lower overall compliance were distance to the cancer center (continuous miles OR: 1.002; p = 0.03) and number of gestations (continuous OR: 1.23; p = 0.01). Patients with more advanced age (years of age continuous OR: 0.96; p < 0.01) and of Hispanic ethnicity (OR: 0.39; p < 0.01) had better compliance (Table 2).

Financial reasons were the cause of 21.7% (10/46) of the loss of follow-up events. These events occurred mostly after 30 months (7/10) from the end of treatment and were less frequent in older patients (continuous years of age OR: 0.91; p = 0.03) (Fig. 2). Discontinuity of surveillance due to moving care to other institution/area was responsible for 28.3% of the events (13/46) and occurred within 24 months from the end of treatment (12/13). In 23 cases (50%) the cause was classified as ‘not disclosed’. Patients living far from the cancer center
The present study detected a substantial decline in the surveillance rate over time after completion of definitive radiotherapy for locally advanced cervical cancer. One out of every seven patients did not achieve one year of follow-up and one-third were lost after three years. This decline occurred early in the post-treatment period when most of the recurrences (Rose et al., 1999; Zuliani et al., 2014; Shrivastava et al., 2018) and disabling side-effects (Fokdal et al., 2018; Sapienza et al., 2020) were expected to occur.

Importantly, we found that more than 20% of the interruptions in follow-up were specifically related to financial reasons. Although our population had access to medical services via a safety network insurance system at the time of treatment, many of them experienced difficulties maintaining regular surveillance. A complex combination of reduced labor capacity, non-flexible work hours, divided attention with family responsibilities such as childcare, and limited transportation options may explain this finding. After a literature review, we identified only two studies (Mandal, 2000; Zamorano et al., 2019) from developing countries (Guatemala and India) that reported surveillance rates. An inter-study comparison (Table 3) including the present series suggests that, in addition to lower rates of concurrent chemotherapy use and treatment completion, follow-up compliance is also reduced in a resource-constrained environment (e.g., loss of follow-up rate at 3 years: 33% in current series vs 73.5% previously described in India (Mandal, 2000).

Younger patients, previously associated with more treatment breaks during radiation delivery (Echeverria et al., 2017), were found to also have a higher chance of early interruption of post-treatment surveillance. Other socio-demographic factors (higher number of pregnancies and greater distance from the patient’s home to the community cancer center) also negatively affected the compliance. Of note, a majority of the financial-related interruptions of follow-up occurred after 30 months, suggesting that the first two and half years post-treatment is a critical window for implementation of measures that aim to retain patients in cancer survivorship programs.

A separate analysis of discontinuity of follow-up due to moving care was performed since this type of event may lead to ambiguous interpretations. It could be considered a positive change to move care when a patient without disease recurrence migrates to another area (city, state) due to convenience, personal preferences, and better work opportunities. Another example is the case when a patient with recurrent disease seeks subsequent lines of salvage therapy not available at the initial institution (e.g., enrollment on clinical trials of new therapies). On the other hand, move of care could be considered negative because detailed treatment information, needed for optimal monitoring or for planning the salvage treatments, are more accessible to the initial medical team. As expected, patients that lived far from the cancer center had a higher chance of moving care to other institutions. Interestingly, women of Hispanic ethnicity were found to be less prone to loss follow-up due to move of care, possibly due to ideologies of the region where the study was conducted (e.g., population with a large proportion of immigrants) and the highly effective interpreter-assisted consults system. In contrast to the financial-related discontinuity that occurred after 30 months, most of the patients’ move to other institutions took place within the first 2 years.

The reasons for loss of follow-up varied among specialties. The most common reason for discontinuing gynecologic oncologist visits was transfer of care to another institution (56%), followed by financial reasons (43%). For the radiation oncologist, disease progression not amenable to local therapy was the most important factor (31%) in interruption the follow-up. In addition to that, 25% of patient interrupted follow-up with the radiation oncologist was secondary to physician discharge from clinic (without recurrence), which contributed to the median follow-up time of less than one year with radiation oncologist. Given the specific knowledge of dose distribution to organs

---

**4. Discussion**

---

**Table 1**

| Patients and treatment characteristics. | Median (range) |
|----------------------------------------|---------------|
| Age (years)                            | 46.5 years (26-84) |
| BMI (kg/m²)                            | 29.6 (13.2-53.9) |
| Distance Home to Clinic (miles)        | 16.5 (0.6-1552) |
| Ethnicity                              |               |
| Asian                                  | 1.9%          |
| Black                                  | 16.2%         |
| Hispanic                               | 54.9%         |
| Native American                        | 0.6%          |
| White                                  | 14.9%         |
| Other                                  | 11.7%         |
| Language                               |               |
| English speakers                       | 42.2%         |
| Non-English speaker                    | 57.8%         |
| Marital Status                         |               |
| Single                                 | 48.1%         |
| Divorced or Widowed                    | 20.7%         |
| Married or Life partner                | 31.2%         |
| Gestations                             |               |
| None                                   | 2.6%          |
| 1-5                                    | 79.9%         |
| >5                                     | 16.9%         |
| NA                                     | 0.6%          |
| Previous Abortion                      |               |
| None                                   | 58.4%         |
| Yes                                    | 41.6%         |
| NA                                     | 5.4%          |
| Comorbidities                          |               |
| None                                   | 61.7%         |
| Yes                                    | 38.3%         |
| Smoking History                        |               |
| Never                                  | 74.7%         |
| Former or current                      | 25.3%         |
| Performance Status (ECOG)             |               |
| 0                                      | 37%           |
| 1-2                                    | 51.3%         |
| NA                                     | 11.7%         |
| Histology                              |               |
| Squamous cell carcinoma                | 85.7%         |
| Adenocarcinoma                         | 10.4%         |
| Adenosquamous carcinoma                | 1.9%          |
| Undifferentiated carcinoma             | 1.9%          |
| FIGO Stage                             |               |
| I or II                                | 24.0%         |
| III or IVA                             | 76.0%         |
| BT Type                                |               |
| Intrauterine (tandem and ovoid)        | 61.7%         |
| Intersitial (Syed)                     | 38.3%         |
| Concurrent Chemotherapy                |               |
| Yes                                    | 98.7%         |
| No                                     | 1.3%          |
| Radiation Oncologist Sex               |               |
| Female                                 | 50.6%         |
| Male                                   | 49.4%         |
| Gynecologic Oncologist Sex             |               |
| Female                                 | 87.7%         |
| Male                                   | 11.7%         |
| NA                                     | 0.6%          |

BMI: body mass index. ECOG: Eastern Cooperative Oncology Group. FIGO: Fédération Internationale de Gynécologie et d’Obstétrique (The International Federation of Gynecology and Obstetrics). BT: brachytherapy. NA: not available.

*(Comorbidities evaluated: diabetes mellitus, cardiovascular disease, cerebrovascular disease, chronic obstructive pulmonary disease, chronic kidney or liver disease, and acquired immunodeficiency syndrome.)*

(Continuous miles OR: 1.001; p = 0.04) had a higher chance of moving care, whereas patients of Hispanic ethnicity were less prone to move care (OR: 0.25; p = 0.04). The most frequent reasons for discontinuity of follow-up were local progression not amenable to local therapy (metastatic or large pelvic recurrence) for the radiation oncologist (31.3%) and moving care for the gynecologic oncologist (56.5%).
at risk, the treating radiation oncologist has a relevant role in the management of late effects of therapy. However, these effects may not be evident for years (Eifel et al., 1995; McIntyre et al., 1995; Vittrup et al., 2021) and therefore require regular, long-term follow up.

The major limitations of our study are related to its retrospective design, including a high proportion of cases with unclassified reason of loss of follow-up, which reduced the power of the secondary analyses. Another limitation is the lack of data on other demographic variables, such as education level, family income and age at the time of the first pregnancy. Finally, we did not test whether disease-related outcomes were affected by follow-up compliance. However, such a relationship would be difficult to demonstrate, as active surveillance is required to detect disease failure events. Notwithstanding, the present study was able to detect important aspects of the adherence to post-treatment surveillance, including risks factors for early discontinuity in the community setting, and may help shape cancer survivorship programs.

In summary, there is a high rate of follow-up discontinuity in patients with locally advanced cervical cancer with one-third of patients not compliant three years following completion of definitive radiotherapy. Young, non-Hispanic, multiparous women that live far from the community cancer center are at increased risk and could benefit from targeted social assistance to ensure adequate long-term surveillance.

**Author contributions**

LGS, JJT, and MSL designed the study. LGS, JJT, AEE, SS, DAH, TRH, and MSL supervised data abstraction and vouch for the data. LGS and JJT analyzed the data and vouch for it. LGS and JJT wrote the first draft of the manuscript. All authors approved the final version of the manuscript and decided to publish the paper.

**Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

---

**Table 2**

| Variable                          | Categories       | Univariate (unadjusted) OR (95% CI) | p-value | Multivariate (adjusted model) OR (95% CI) | p-value |
|-----------------------------------|------------------|-------------------------------------|---------|----------------------------------------|---------|
| **Endpoint: Overall Follow-Up Discontinuity** |                   |                                     |         |                                        |         |
| Age (years)                       | Continuous       | 0.98 (0.95–1.01)                   | 0.13    | 0.96 (0.93–0.99)                       | <0.01   |
| Language                          | English          | Reference                           |         |                                        |         |
| Ethnicity (Hispanic)              | Non-English      | 0.58 (0.33–1.04)                   | 0.07    | –                                      | –       |
| Hispanic                          | Reference        |                                     |         |                                        |         |
| Distance to Cancer Center (miles) | Continuous       | 1.001 (1.000–1.002)                | 0.07    | 1.002 (1.000–1.003)                    | 0.03    |
| Marital Status                    | With partner?    | Reference                           |         |                                        | –       |
| Gestations                        | No partner       | 0.67 (0.37–1.23)                   | 0.20    | –                                      | –       |
|                                  | Continuous       | 1.09 (0.96–1.23)                   | 0.20    | 1.23 (1.05–1.43)                      | 0.01    |

* Only variables with p < 0.25 are shown.

† Only variables with p < 0.05 in the final model are shown.

‡ With current partner: marriage or life partner. No current partner: single/divorced or widowed.
Fig. 2. Follow-up compliance over time. Red line: financial-related. Blue line: moved care. Black line: overall loss of follow-up. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Table 3
Comparison of the surveillance compliance in different cohorts.

| Author                        | Publication Year | Number of Patients | Country          | Started Treatment | Concurrent Chemotherapy | Completed Treatment | Follow-up Rates | Reasons for Loss of Follow-Up |
|-------------------------------|------------------|--------------------|------------------|-------------------|------------------------|-------------------|----------------|-------------------------------|
| Mandal et al. (2000)          | 1991             | 1003               | India            | 58.6%             | <14%*                  | NA                | NA              | NA                            |
| Zamorano et al. (2019)        | 2005–2007        | 92                 | Guatemala        | 81.5% (75/1003)   | 4% (3/75)              | 72.8% (67/92)     | 26.8% (23/89) | 21.7% financial                |
| Sapienza et al. (2020)*       | 2013–2020        | 154                | United States    | 100% (154/154)    | 100% (154/154)         | 100% (154/154)    | 100% (154/154) | 28.3% moved care               |
|                              |                  |                    |                  |                   |                        |                   | 25.8% (72/282) | 15.3% not available           |

* Present study.

Estimated (86.9% received radiotherapy or surgery only).

Appendix A. Supplementary material

Supplementary material to this article can be found online at http://dx.doi.org/10.1016/j.gore.2022.101091.

References

Baiocchi, G., Guimarães, G.C., Faloppa, C.C., Kumagai, L.Y., Oliveira, R.A.R., Begnami, M.D., Soares, F.A., Lopes, A., 2013. Does histologic type correlate to outcome after pelvic exenteration for cervical and vaginal cancer? Ann. Surg. Oncol. 20 (5), 1694–1700.

Booth, C.M., Li, G., Zhang-Salomon, J., Mackillop, W.J., 2010. The impact of socioeconomic status on stage of cancer at diagnosis and survival: a population-based study in Ontario, Canada. Cancer 116 (17), 4160–4167.

Cox, D.R., 1972. Regression models and life-tables. J. R. Stat. Soc. B 34 (2), 187-220.

Echeverría, A., Manley, H., O’Donnell, B., Asper, J., Bonnen, M., Ludwig, M., 2017. Factors associated with radiation treatment compliance for women with cervical cancer in a safety net health system. Int. J. Gynecol. Cancer 27 (7), 1464-1471.

Eifel, P.J., Levenback, C., Wharton, J., Oswald, M., 1995. Time course and incidence of late complications in patients with radiotherapy for FIGO stage IB carcinoma of the uterine cervix. Int. J. Radiat. Oncol. Biol. Phys. 32 (5), 1289–1300.

EMBRACE. Available: https://www.embracestudy.dk [accessed 10 September 2021].

Fokdal, L., Potter, R., Kirchheiner, K., Lindegaard, I.C., Jensen, N.B.K., Kirisits, C., Chargari, C., Mahantshetty, U., Jürgenlikm-Schulz, I.M., Segedin, B., Hoskin, P., Tanderup, K., 2018. Physician assessed and patient reported urinary morbidity after radio-chemotherapy and image guided adaptation brachytherapy for locally advanced cervical cancer. Radiother. Oncol. 127 (3), 423-430.

Kaplan, E.L., Meier, P., 1958. Nonparametric estimation from incomplete observations. J. Am. Stat. Assoc. 53, 457-481.

Lawhead Jr, R.A., Clark, D.G., Smith, D.H., Pierce, V.K., Lewis Jr, J.L., 1989. Pelvic exenteration for recurrent or persistent gynecologic malignancies: a 10-year review of the Memorial Sloan-Kettering Cancer Center experience (1972–1981). Gynecol. Oncol. 33 (3), 279–282.

Mandal, K.R.S., 2000. Pattern of compliance with treatment and follow-up of cervical cancer patients at Chittaranjan National Cancer Institute, Calcutta. Asian Pac. J. Cancer Prev. 1 (4), 289-292.

McIntyre, J.F., Eifel, P.J., Levenback, C., Oswald, M.J., 1995. Ureteral stricture as a late complication of radiotherapy for stage IB carcinoma of the uterine cervix. Cancer 75 (3), 836-843.

Miller, B., Morris, M., Rutledge, F., Mitchell, M.F., Atkinson, E.N., Burke, T.W., Wharton, J.T., 1993. Aborted exenterative procedures in recurrent cervical cancer. Gynecol. Oncol. 50 (1), 94–99.

National Comprehensive Cancer Network. Available: http://www.nccn.org [Accessed 10 September 2021].

Potter, R., Haie-Meder, C., Van Limbergen, E., et al., 2006. Recommendations from gynecological (GYN) GEC ESTRO working group (II): concepts and terms in 3D image-based treatment planning in cervix cancer brachytherapy-3D dose volume parameters and aspects of 3D image-based anatomy, radiation physics, radiobiology. Radiother. Oncol. 78, 67-77.

Rose, P.G., Bundy, B.N., Watkins, E.B., Thigpen, J.T., Deppe, G., Maiman, M.A., Clarke-Pearson, D.L., Inalsaco, S., 1999. Concurrent cisplatin-based radiotherapy and chemotherapy for locally advanced cervical cancer. Radiother. Oncol. 33 (3), 279–282.

Sapienza, L.G., Salcedo, M.P., Ning, M.S., Jhingran, A., Kloppe, A.H., Catalva, V.F., Schmelzer, K.M., Leite Gomes, M.J., de Freitas Carvalho, E., Baiocchi, G., 2020. Pelvic insufficiency fractures after external beam radiation therapy for gynecologic cancers.
a meta-analysis and meta-regression of 3929 patients. Int. J. Radiat. Oncol. Biol. Phys. 106 (3), 475–484.
Shrivastava, S., Mahantshetty, U., Engineer, R., Chopra, S., Havaldar, R., Hande, V., Kerkar, R.A., Maheshwari, A., Shylasree, T.S., Ghosh, J., Bajpai, J., Gurram, L., Gulia, S., Gupta, S., 2018. Cisplatin chemoradiotherapy vs radiotherapy in FIGO stage IIIb squamous cell carcinoma of the uterine cervix: a randomized clinical trial. JAMA Oncol. 4 (4), 506.
Smirnov, N., 1948. Table for estimating the goodness of fit of empirical distributions. Ann. Math. Stat. 19 (2), 279–281.
Sung, H., Ferlay, J., Siegel, R.L., Laversanne, M., Soerjomataram, I., Jemal, A., Bray, F., 2021. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J. Clin. 71 (3), 209–249.
Vittrup, A.S., Tanderup, K., Bentzen, S.M., Jensen, N.R.K., Spampinato, S., Fokdal, L.U., Lindegaard, J.C., Sturdza, A., Schmid, M., Segedin, B., Jürgenliemk-Schulz, I.M., Bruheim, K., Mahantshetty, U., Haie-Meder, C., Rai, B., Cooper, R., van der Steen-Banasik, E., Sundet, M., Huang, F., Nout, R.A., Villafranca, E., Van Limbergen, E., Pieters, B.R., Tan, I.T., Litgenn, I.C.H.W., Hoskin, P., Pöiter, R., Kirchheiner, K., 2021. Persistence of late substantial patient-reported symptoms (LAPERS) after radiochemotherapy including image guided adaptive brachytherapy for locally advanced cervical cancer: a report from the EMBRACE study. Int. J. Radiat. Oncol. Biol. Phys. 109 (1), 161–173.
Wilcoxon, F., 1945. Individual comparisons by ranking methods. Biometr. Bull. 1 (6), 80–83.
Zamorano, A.S., Barnoya, J., Gharzouzi, E., Chrisman Robbins, C., Orozzo, E., Polo Guerra, S., Match, D.G., 2019. Treatment compliance as a major barrier to optimal cervical cancer treatment in Guatemala. J. Glob. Oncol. (5), 1–5.
Zuliani, A.C., Barros Esteves, S.C., Teixeira, L.C., Teixeira, J.C., de Souza, G.A., Sarian, L.O., 2014. Concomitant cisplatin plus radiotherapy and high-dose-rate brachytherapy versus radiotherapy alone for stage IIIb epidermoid cervical cancer: a randomized controlled trial. J. Clin. Oncol. 32 (6), 542–547.