respectively. Favourable prognostic factors in univariate and multivariate analysis were early stage, tumour size < 4 cm (after adjusting for the residual disease after radiation), no pelvic lymph node involvement and one week gap between EBRT and HDR brachytherapy in three-year DFS (p = 0.001, p = 0.012, p = 0.005, p = 0.005 respectively). The three-year OS rate was 85.7%, 76.4%, 42%, and 33.3% for Stages I, II, III, and IVA, respectively.

Favourable prognostic factors in univariate and multivariate analysis were early stage, tumour size < 4 cm, no pelvic lymph node involvement, one week gap between EBRT and HDR brachytherapy and no distant metastasis (during the follow up) in three-year OS (p = 0.001, p = 0.002, p = 0.002, p = 0.002, p = 0.001 respectively).

Conclusions: HDR brachytherapy with Co-60 remote after loading system was successful and it showed HDR brachytherapy in treating patients with carcinoma of cervix was effective after EBRT with acceptable rectal and bladder complications.

110 INTRAOPERATIVE FACTORS ASSOCIATED WITH IODINE-125 PLACEMENT ACCURACY IN PROSTATE BRACHYTHERAPY
Muhammad Faisal Jamaluddin, Sunita Ghosh, Michael Waine, Ronald Sobode, Michael Tavakoli, John Amanie, Don Yee, Albert Murtha, Nawaid Usmani
University of Alberta, Edmonton, AB

Purpose: The quality of prostate brachytherapy implant depends on accurate placement of seeds in their intended locations. This study will investigate intraoperative factors that potentially contribute to seed placement inaccuracy in prostate brachytherapy.

Methods and Materials: Intraoperative video images of the brachytherapist’s hands motion and needle insertions during the implant procedure were acquired for analysis. Using video analysis software, maximum and average insertion velocities were measured. Number of needle insertion attempts and the use of brachytherapist’s other hand to manipulate the lateral needle movements were also recorded. Magnitude of seed displacements from their target location were measured in ultrasound images acquired following completion of each implant using VariSeed treatment planning software.

Results: Fifteen patients agreed to undergo this study. 1619 iodine-125 seeds were inserted using 357 needles. 1197 seeds were confidently identified in the ultrasound images and included in the analysis. Mean overall displacement was 0.49 cm (0 to 2.1 cm, 95% CI = 0.48-0.52). Six hundred and fourteen seeds were delivered with a single pass and 583 seeds were delivered with > 1 passes (range 1 to 6). Mean maximum velocity was 12.17 cms-1 (range 4 to 28 cms-1) and mean average velocity was 4.77 cms-1 (range 0.4 to 17.4 cms-1). Seven hundred and forty-seven seeds were delivered with manipulation of the needle by the brachytherapist’s other hand. Generalized linear model (GLM) was used to determine the factors contributing to seed displacement and found that maximum insertion velocities < 12 ms-1 was associated with a decrease in seed displacements by 0.049cm compared to maximum speed of > 12 cms-1 (95%CI: -0.09; -0.01, p = 0.0121). Other evaluated factors did not show any statistically significant correlation with seed displacement: average speed (95%CI: -0.05; 0.02, p = 0.4947), lateral manipulation of needle (95%CI: -0.04; 0.04, p = 0.9264) and number of needle passes (95%CI: -0.02; 0.01, p = 0.8907).

Conclusions: This study identified that needles inserted with lower maximum velocities were associated with less seed displacement. Lateral manipulation of needle, number of passes and average speed did not show statistically significant correlation with the magnitude of seed displacement.

111 PAIN AND OPIOID USE IN GYNECOLOGICAL CANCER PATIENTS TREATED WITH INTERSTITIAL BRACHYTHERAPY
Lucas C. Mendez2, Lisa Barbera2, Stephen Choi2, Laura D’Alimonte2, Eric Leung2
1University of São Paulo, São Paulo, Brazil 2University of Toronto, Toronto, ON

Purpose: Interstitial brachytherapy (ISBT) implantation has advantages over standard intracavitary techniques in locally-advanced gynecological malignancies. The insertion of implanted catheters directly into tumour tissue enables higher radiation dose conformity and normal tissue sparing. Nevertheless, this procedure can be associated with pain and discomfort because of its invasiveness. The goal of this study is to assess pain and opioid use by patients implanted with a perineal ISBT applicator for treatment with brachytherapy.

Methods and Materials: Thirty-nine patients treated with high-dose rate ISBT using a perineal template from September 2014 to January 2016 were included in a prospective registry trial. Median age was 65 (range 23-88) and the cohort included 13 cervical cancers patients, 11 primary vaginal cancers, 11 recurrent endometrial cancers, one vulvar cancer and three palliative treatments. Patient characteristics (age, obesity, diabetes, use of anti-depressants/anxiolytics) and technical ISBT implantation data (number of needles, depth of implantation and pelvic organ intrusion) were collected. Quantity of opioid use (morphine-oral-equivalent-dose (MoED) per day) and maximum pain scores (0-10) at rest or with movement were evaluated. Paired t-test was used for opioid comparison between first and second implantations. Regression linear analysis was used to identify independent predictors of opioid use.

Results: The majority of patients (34) were initially treated with a course of external beam radiation therapy with a median dose of 45 Gy to the pelvis. Twenty-two patients had a single ISBT implantation while 17 had a second implantation, one week later. The median number of needles used for each implant was 17 (8-26) and a median of three (2-5) fractions of ISBT treatments were delivered. Mean MoED use per day was statistically higher for the second (55 mg versus 81 mg) procedure as compared to the first insertion (p < 0.05). Maximum pain score at rest or movement was also higher after the second implantation (5/5 versus 7/6). Age (continuous variable) and numbers of implanted catheter needles (dichotomized by median–17 or less versus > 17) were found to be significant predictors of opioid use for the first procedure. Depth of catheter insertion and pelvic organ intrusion were not correlated to opioid use or pain score.

Conclusions: Interstitial brachytherapy patients require adequate analgesia with opioids after applicator insertion and inpatient stay. The second ISBT implantation is associated with greater pain consumption and higher median pain scores (moderate versus moderate to severe). The number of implanted needles correlated with increase in opioid use, whereas age had an inverse correlation.

112 Abstract withdrawn

113 MODELS OF CARE FOR CERVICAL CANCER BRACHYTHERAPY IN ONTARIO
Kitty Chan1, Quinn Benwell2, Ken Schneider2, Michelle Angus4, David D’Souza4, Michael Milosevic4, Lisa Barbera2
1Princess Margaret Cancer Centre, Toronto, ON 2London Regional Cancer Program, London, ON 3Windsor Regional Cancer Centre, Windsor, ON 4Cancer Care Ontario, Toronto, ON 5Odette Cancer Centre, Toronto, ON

Purpose: Magnetic resonance (MR) is considered the gold-standard imaging modality to guide cervical cancer brachytherapy (BT), however introducing this modality into a BT process can be challenging. The Models of Care Working Group within Cancer Care Ontario’s Gynaecological Community of Practice (GYN CoP) of the Radiation Treatment Program focused on developing strategies for Ontario patients to access this technology and expertise. The aim of this study is to identify current models of care for cervical cancer brachytherapy (ccBT)
Results: Patient positioning and mark-up. A qualitative phone interview was designed by the GYN CoP working group to survey the current state of ccBT in the province. Questions were developed to inquire about the current use of image-guided ccBT and the associated referral processes, the usage of MR imaging in ccBT and the current use of image-guided interstitial GYN BT. All ONT cancer centres offering radiation treatments to GYN cancers were included. Two group members conducted and audio recorded the telephone interviews from May to November 2015 and analyzed all recordings and summarized the data.

Methods: A retrospective chart review was conducted among patients who had imaging assessments to determine the size and location of the seroma. Observations recorded prospectively during the practice implants on phantoms and mock PBSI deliveries were used to guide process development, improve quality and refine training, education, and experience.

Results: Thirteen (n = 13) ONT cancer centres were interviewed. Of these, three centres do not offer ccBT, five centres offer CT-guided ccBT, four centres offer a combination of CT-MR-guided ccBT and one centre offers strictly MR-guided ccBT. The three centres that do not offer ccBT have established referral processes with three tertiary cancer centres in ONT respectively. However, there is no standardized referral process, referral timing, or method of communication. Other practices vary throughout the centres. Three of 13 centres suggested developing a referral tool to standardize and facilitate the sharing of external beam and BT plans, distributions and images. All CT-guided ccBT centres except one have plans to develop MRgBT. The tertiary centres mentioned above are also the only centres that offer interstitial GYN BT. They are located in the southwestern part of the province. Of these, one centre offers CT-guided and two centres offer MR-guided interstitial GYN BT. There is currently no standardized guideline to identify patient candidates for interstitial GYN BT.

Conclusions: This study demonstrated that models of shared care exist and are functioning in ONT. While referral processes are functioning well, some areas represent opportunities for improvement. Future work is needed by the GYN CoP to improve referral processes and to develop consensus on indications for interstitial brachytherapy. This will ensure all patients in ONT have access to this high quality brachytherapy.

115 PROPOSAL FOR A PERMANENT BREAST SEED IMPLANT (PBSI) TRAINING PROGRAM
Karen Long1, Ruth Karchewski-Welter2, Michael Roumeliotis2, Elizabeth Watt2, Tyler Meyer2, Siraj Husain2
1Tom Baker Cancer Centre, Calgary, AB
2University of Calgary, Calgary, AB

Purpose: To propose an effective training program for radiation therapy teams starting to implement PBSI brachytherapy for early stage breast cancer.

Methods and Materials: A PBSI program requires a multidisciplinary team including physicians, physicists, dosimetrists, radiation therapists, operating room nurses, anesthetists, machinists and administrative personnel. A PBSI program was launched in 2013. Multiple CT and ultrasound compatible gel phantoms that mimicked breast tissue with embedded seromas, were designed and constructed. Physicians practiced ultrasound guided needle placement into numerous phantoms, with seromas in various locations, to simulate actual patient implants. Post-implant CT scans of phantoms were used to assess implant accuracy. Observations recorded prospectively during the practice implants on phantoms and mock PBSI deliveries were used to guide process development, improve quality and refine training, education, and experience.

Results: Based on our development research, results, and experience, we suggest that a centre starting a PBSI program should have an onsite training course that includes the following modules:
1) PBSI theory: including background, patient eligibility, patient assessments and suitability, process from assessment to treatment and patient care;
2) Treatment planning session: including dosimetric goals and objectives, hands on clinical case examples with comparison to benchmark plans and guided physician evaluation;
3) Participant observation of a PBSI operating room procedure;
4) Active involvement of the participants in practice sessions with phantoms and realistic operating room scenarios;
5) Wrap up session: opportunity to share experiences and problem solve. Group discussion on how to translate their learning to their own practice. Feedback from participants on this training program and areas for improvement; and
6) Follow up: remote pre-plan consults and/or reviews as well as post-plan analyses for several cases.

Conclusions: Effective training with hands on experience followed by support after centre implementation will improve the learning curve, increase confidence, and assist radiation therapy teams to set up a breast brachytherapy program in their department.

116 FIGHTING PROSTATE CANCER WITH OUR EYES OPEN: IMPACT OF MRI STAGING ON RISK ASSESSMENT AND RADIATION THERAPY Meryllie McGuffin1, Chen Jiz2, Bonnie Bristow1, Andrew Loblaw2
1Sunnybrook Health Sciences Centre, Toronto, ON
2University of Toronto, Toronto, ON

Purpose: The risk of tumour progression and recurrence is an important consideration when treating prostate cancer. Risk assessment includes clinical staging through physical...