

THE THREE PILLARS OF CANCER TREATMENT (SURGERY, RADIOTHERAPY AND CYTOTOXIC CHEMOTHERAPY). WHAT ROLE DO THEY PLAY IN CANCER CARE?

Cancer as a disease has been with us throughout human history, from its earliest origins seen in mummified remains of ancient Egypt to the present day. ⁽³⁾ Despite modern advancements in treatment and improved 5-year survival rates, cancer remains a leading burden of disease. In 2022, it was estimated that 162,000 Australians were diagnosed with cancer, with 50,000 dying from the disease. ^(7/8)

As we expand our understanding of cancer biology, new and emerging treatments - such as immuno-oncology (IO), are helping to redefine cancer treatment. Despite this, the traditional treatments (or the three pillars of cancer treatment), of surgery, radiotherapy (RT), and cytotoxic chemotherapy (referred to as chemotherapy throughout the article), remain the most common treatment modalities used in clinical practice. ^(3/9) This article will provide an overview of the three pillars of cancer treatment. Particular attention will be devoted to discussing treatment with palliative intent (that is, treatment given to manage symptoms, not to treat or cure disease). ^(2/16)

The three pillars of cancer treatment reflect their historical progression into modern medicine. Surgery is the first treatment pillar. Ancient manuscripts describe surgical interventions for cancer dating back as far as 3000 BC. Notable advancements in surgery occurred following the discovery of anaesthesia in 1846 with the first radical mastectomy performed in the late 19th century. ⁽³⁾ Surgical techniques have continued to evolve to the modern day with increasing advances in technology giving rise to complex procedures such as robotic surgery for prostate cancer.

Surgery is the most common treatment modality used in cancer control. It can be used to prevent, diagnose, stage, and treat cancer. Surgery can also be used with palliative intent. The percentage of palliative surgery performed varies. Louie & Miner (2022), estimate that up to 13% of all surgical procedures performed at major US medical cancer centres are palliative. ⁽¹⁶⁾ Similarly, Deo, Kumar, & Rajendra, et al., (2022), in their review, determined that 8.2% of all procedures performed at a major tertiary hospital in India were palliative – 36.4% for gastro-oesophageal malignancies (to manage dysphagia or obstruction), 24% for colorectal cancers (for tube placement, bypass or diversion procedures), and 12% for breast cancer (to manage fungating and/or bleeding tumours). ⁽¹⁰⁾

Surgical services are provided throughout Grampians Health, particularly in Ballarat and Horsham, and St John of God Healthcare provide a private service in Ballarat. Many palliative procedures described above can be performed in Ballarat. However, patients requiring more complex surgical procedures such as, nodal dissection for head and neck cancer, may need to travel to a specialist centre generally located in Melbourne.

Our second pillar of cancer treatment RT. RT was developed following the discovery of the x-ray by German physics professor, Wilhelm Conrad Roentgen in 1896 ^(3/6) RT uses high-energy x-ray or other particles to destroy cancer cells by damaging their DNA. ^(1/5) With the increasing advances in physics and computer technology, radiation treatment can be delivered more precisely using a number of techniques such as, computer tomography (CT) to map the cancer in 3D. ⁽⁴⁾ External beam radiation therapy (EBRT), a form of localised RT that uses a machine (linear accelerator (LINAC)), to aim high-energy rays at the cancer from outside of the body, is the most common treatment modality used. ^(3/4)

Like surgery, RT has several treatment roles in cancer. It can be used with curative intent such as definitive RT (RT that is delivered as the sole treatment to control disease), in combination with chemotherapy (chemoradiation where chemotherapy is used to improve RTs efficacy), or following surgery (called adjuvant RT). It can also be used with palliative intent. ^(5/17)

More than 40% of patients with advanced cancer will receive RT with palliative intent. RT has many benefits in this context. It is efficient, cost-effective, non-invasive and generally well-tolerated ^(15/20) Palliative RT can be used to treat a myriad of symptoms including pain, (particularly pain resulting from metastatic bone disease), bleeding (in advanced breast and gynaecological cancers), dysphagia, compression and obstruction (in gastrointestinal cancers), neurological symptoms associated with spinal cord compression and can provide locoregional control of disease. ^(15/20)

The term Gray (Gy), is used to measure the total amount of radiation treatment a patient is given. Treatment is divided into fractions so the total Gy can be delivered over time. Palliative RT schedules are generally hypofractionated (that is, a larger fraction is given with fewer total fractions). This helps to maximise treatment outcome and reduce the logistical burden on the patient to attend the centre for multiple treatments. ^(14/20)

Two LINAC machines are located at the Ballarat Austin Radiation Oncology Centre (BAROC) within the Ballarat Regional Integrated Cancer Centre (BRICC). BAROC deliver EBRT using a number of techniques (for more information go to <https://www.bhs.org.au/services-and-clinics/cancer-services/radiation-therapy-techniques/>). ⁽¹²⁾ BAROC also support the delivery of the Stawell Austin Radiation Oncology Service (SAROS) which provides superficial x-ray to treat skin cancers. ⁽¹³⁾

Side effects associated with RT will depend on the goal of treatment and anatomical location. The good thing to know is that you do not have to work in the dark when supporting your patients, as BAROC have a multidisciplinary team available to support staff and patients both during and following RT treatment.

Our final treatment pillar related to this discussion is chemotherapy. This treatment pillar has a darker origin story. Soldiers exposed to mustard gas during World War II were found to have toxic changes to their bone marrow cells. This, along with other testing at the time, helped to develop the first cytotoxic agent called nitrogen mustard, which was found to be an effective treatment for lymphoma. This served as the blueprint towards developing other drugs throughout the second half of the 20th century. ^(3/6) Chemotherapy works by killing fast growing cells by interfering with DNA synthesis, and replication at different points of the cell cycle. Improvements in how the drugs are administered occurred in the 1970s where combination chemotherapy was found to be more effective in obtaining a cancer cell kill (by acting on different points in the cell cycle), than administering a single agent. Today, clinical trials help to ensure optimal use of these agents to achieve the best outcomes for patients. ⁽¹¹⁾

Chemotherapy can be administered for both haematological and solid tumour cancers. This distinction is important as there are a number of defining roles depending on disease type, for example, chemotherapy can be given as induction, consolidation or maintenance treatment to a patient with acute leukaemia to obtain, and then maintain disease remission. Chemotherapy administered for solid tumours can be administered with curative intent (either before surgery neoadjuvant or, following surgery, adjuvant). Once again, chemotherapy can be administered with palliative intent, for example, gemcitabine can be administered to a patient with pancreatic cancer to alleviate pain, improve physical function, and slow the onset of symptoms such as dyspnoea and constipation. ⁽¹⁴⁾

In a 2017 commentary, Alfred, Neugut and Prigerson (2017), contend the terms traditionally used to describe treatment intent with chemotherapy require amendment to reflect current practice, that is, treatment can be administered for life-extending intent. This term means that treatment is given to extend life, but does not meet the definition of cure. ⁽¹⁾ In this context, treatment can be administered over months to years.

In the Grampians Region, chemotherapy is commonly administered with palliative and life extending intent to a variety of patients with solid tumours such as, breast cancer, colorectal cancer, lung cancer, upper gastrointestinal cancers, melanoma and head and neck cancers. The majority of treatment is administered intravenously by staff with specialist training in cancer care. A number of Oncology Day Units are located throughout the Grampians region. Ballarat has two private centres – one at St John of God Healthcare, with the other located at the Ballarat Day Procedure Centre. A large oncology day unit is located within BRICC, and Grampians Health Horsham. Two smaller public satellite services are located at East Grampians Health Service Ararat, and Grampians Health Stawell.

New nursing models of cancer care have emerged to provide multidisciplinary and coordinated care to patients. Cancer Resource Nurses are available throughout the Wimmera Region to provide supportive care to those affected by a cancer diagnosis within their local community (for more information go to <https://www.vics.org.au/gics-health-prof>). Nurse lead Symptom and Urgent Review Clinics are helping patients manage the side effects associated with treatment such as pain, chemotherapy induced nausea and vomiting, fatigue, and diarrhoea. One clinic is located at the Day Oncology Unit at BRICC, and another at Grampians Health Horsham.

So how do we determine what treatment is required for which patient? Each patient's cancer will be different even in situations where patients are diagnosed with the same cancer type. Establishing treatment intent (or treatment goal), involves a complex decision-making process where a number of variables are considered such as, the patient's cancer type, stage and grading of their cancer, predictive and prognostic biomarkers, the patient's performance status and treatment preference/s, and what evidence-based treatment/s are available to treat their particular cancer. As we understand more about cancer and the specific genetic aberrations driving cancer growth, treatment is becoming more personalised. ⁽⁹⁾

Determining treatment intent is supported with Multidisciplinary Meetings (MDTs) which are held virtually to cover the entire Grampians Region. MDTs help to determine optimal treatment plans for patients (to see when MDT meetings are held, go to <https://www.vics.org.au/gics-health-prof>). The importance of multidisciplinary and coordinated care, involving all members of the treating team - medical, nursing, palliative care, allied health and community care, is seen in the Victorian Governments Cancer Service Framework, where a multidisciplinary team approach is considered the gold standard. ^(18/19)

In closing, I should mention the online eviQ cancer treatment resource. This is a free to access Australian based information portal listing all the PBS prescribed treatments for haematology, medical oncology and RT. This is an excellent resource for all health care professionals as the treatment schedules outline all the potential side effects associated with treatment, and includes information on how to manage them (for more information go to <https://www.eviq.org.au/>).

This synopsis provides a brief summary of the three pillars of treatment most commonly seen in the Grampians Region to treat cancer. The reality is that patients seen in clinical practice will require a combination of treatments to manage their disease. As we understand more about cancer biology, new and emerging treatments are making treatment more personalised. The traditional narrative of palliative intent is starting to change particularly with chemotherapy. Cancer is now considered a chronic disease where patients even with advanced disease, can receive life extending treatment over considerable timeframes. Open and honest communication is required to ensure the patient and their loved ones understand treatment intent as they adjust to the ever-changing nature of their disease.

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