

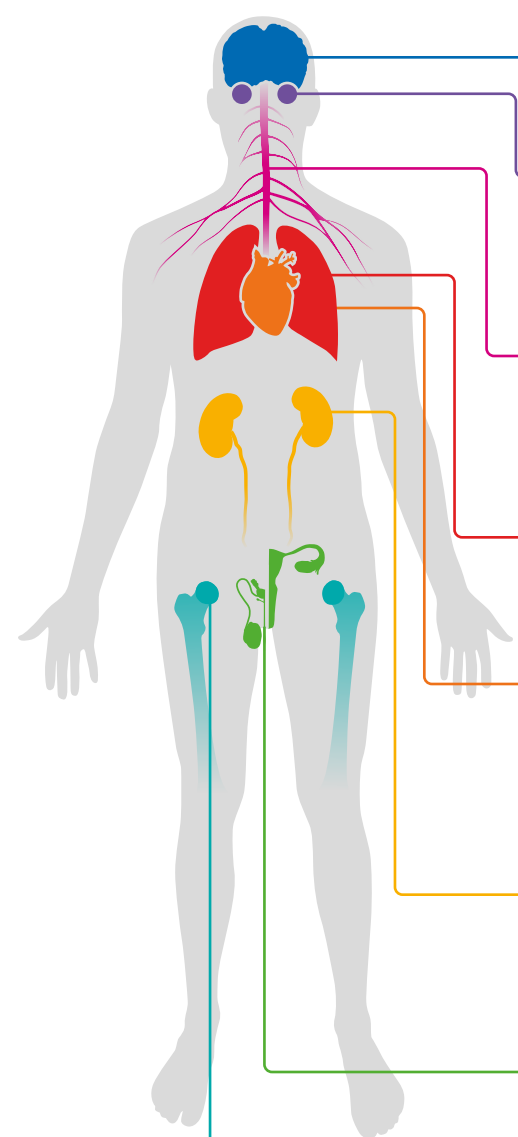
Managing long term side effects of chemotherapy

Teenagers and young adults (TYA) who survive cancer treatment can have a range of side effects later in life. If it is known which chemotherapeutic agents were used, the "Principal causative drugs" column can guide monitoring and management. Factors that further increase the risk of complications from chemotherapy are listed in the "risk groups" section.

© 2016 BMJ Publishing group Ltd.

Disclaimer: This infographic is not a clinical decision aid. This information is provided without any representations, conditions or warranties that it is accurate or up to date. BMJ and its licensors assume no responsibility for any aspect of treatment administered with the aid of this information. Any reliance placed on this information is strictly at the user's own risk. For the full disclaimer wording see BMJ's terms and conditions: <http://www.bmj.com/company/legal-information/>

thebmj Read the full article online <http://bmj.co/chemfx>



Side Effect	Principal causative drugs	Risk groups	Managing those at risk
Loss of executive function	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other	Concurrent cranial RT ³	Baseline MMSE ⁴ (Repeat if symptoms) Consider: Neurorehabilitation, Psychotropic drugs Encourage communication with school/university/place of work Consider referral to: Social worker, Psychologist, Occupational therapist
Memory loss	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other	Concurrent cranial RT ³	Funduscopy (Every year) Refer to ophthalmology if symptoms
Cataract	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other	Concurrent RT ³	Funduscopy (Every year) Refer to ophthalmology if symptoms
Peripheral neuropathy	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	Smoking	Neurological examination (Every year for first 3 years, then after symptoms change) Baseline audiological assessment (Repeat if symptoms) Refer to ENT specialist if changes Consider: Hearing aid, Speech therapy, Assessment of reversible causes Offer advice: Against smoking, Respiratory specialist review before anaesthesia or SCUBA diving
Tinnitus	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other	Smoking	Baseline audiological assessment (Repeat if symptoms) Refer to ENT specialist if changes Consider: Hearing aid, Speech therapy, Assessment of reversible causes Offer advice: Against smoking, Respiratory specialist review before anaesthesia or SCUBA diving
Deafness	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other	Smoking	Baseline audiological assessment (Repeat if symptoms) Refer to ENT specialist if changes Consider: Hearing aid, Speech therapy, Assessment of reversible causes Offer advice: Against smoking, Respiratory specialist review before anaesthesia or SCUBA diving
Raynaud's phenomenon	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	Smoking	Warm gloves in winter Calcium channel blockers
Pulmonary fibrosis	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	Smoking + RT ³ , Younger, HD ¹ , Exposure to high O ₂ concentration, Renal dysfunction	Baseline tests: Chest radiograph, Lung function Respiratory examination (Every year) Vaccinations: Influenza, Pneumococcal
Ventricular failure	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	CVS risks: Smoking, Diabetes, High cholesterol; Mediastinal RT ³ , High dose, Time since chemo; Pregnancy	Encourage early presentation (Cardiac disease may occur at much younger ages in people who have had chemotherapy) MUGA ⁵ /echocardiogram Consider ECG and blood pressure (Every year)
Coronary artery disease	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	CVS risks: Smoking, Diabetes, High cholesterol; Mediastinal RT ³ , High dose, Time since chemo; Pregnancy	Encourage early presentation (Cardiac disease may occur at much younger ages in people who have had chemotherapy) MUGA ⁵ /echocardiogram Consider ECG and blood pressure (Every year)
Hypertension	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	CVS risks: Smoking, Diabetes, High cholesterol; Mediastinal RT ³ , High dose, Time since chemo; Pregnancy	Encourage early presentation (Cardiac disease may occur at much younger ages in people who have had chemotherapy) MUGA ⁵ /echocardiogram Consider ECG and blood pressure (Every year)
Chronic kidney disease	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	Prior renal dysfunction, Diabetes	Blood pressure (Every year) Urinalysis (Every year) Baseline urea and electrolytes (Repeat if symptoms or signs of renal failure)
Haemorrhagic cystitis	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	Concurrent RT ³ to urinary tract	Encourage self reporting (Advise patient to report potential symptoms) Refer to renal specialist if deterioration in symptoms or results
Renal tract malignancy	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	Concurrent RT ³ to urinary tract	Encourage self reporting (Advise patient to report potential symptoms) Refer to renal specialist if deterioration in symptoms or results
Infertility	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	Older age at time of treatment + RT ³ to gonadal region, Higher cumulative doses	Fertility preservation (Refer all TYA ⁷ undergoing chemotherapy to fertility preservation services) Baseline bloods: Men (Testosterone), Women (LH, FSH, Oestradiol) Hormone replacement
Primary hypogonadism	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	Older age at time of treatment + RT ³ to gonadal region, Higher cumulative doses	Fertility preservation (Refer all TYA ⁷ undergoing chemotherapy to fertility preservation services) Baseline bloods: Men (Testosterone), Women (LH, FSH, Oestradiol) Hormone replacement
Necrosis of femoral head	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	Concurrent RT ³	Clinical examination (Every year) Refer for MRI if clinical suspicion
Second malignant neoplasm	Alkylating agents: Busulfan, Cisplatin, Cyclophosphamide, Ifosfamide, Other; Anthracyclines; Antimetabolites; Bevacizumab; Bleomycin; Prednisolone HD ¹ ; Taxanes; Trastuzumab; Vincristine; Vinorelbine; Topo II inhibitors ²	High dose + RT ³ , t-AML survivors, Autologous stem cell transplant	Full blood count for t-AML survivors (Every year) After thoracic radiotherapy: Enhanced breast cancer surveillance Breast self-exam (Every month)
Psychosocial problems	Possible with all chemotherapy	CNS tumour, Hearing loss, Female, Younger, Cranial RT ³ , Learning difficulties, Lower SEG ⁶	Psychosocial assessment (Every year) Support groups, Psychology referral, Counselling, Antidepressants, Anxiolytics Assess impact on family members and carers
Fatigue	Most chemotherapeutic agents	Depression	Psychosocial assessment (Every year) Screen for underlying depression, Rule out reversible causes, Advise short bursts of exercise
Osteoporosis	Most chemotherapeutic agents	Smoking	Bone density scan (Calcium and vitamin D according to results) Rule out hypogonadism

Psychosocial effects of chemotherapy include:

- Post-traumatic stress disorder
- Financial burden
- Depression
- Employment difficulties
- Social isolation
- Educational difficulties
- Strained relationships with partner, family, and peers

¹HD = High dose ²Topoisomerase II inhibitors ³RT = radiotherapy ⁴Mini Mental State Examination ⁵Multigated acquisition scan ⁶SEG = socio-economic grouping ⁷TYA = teenagers and young adults