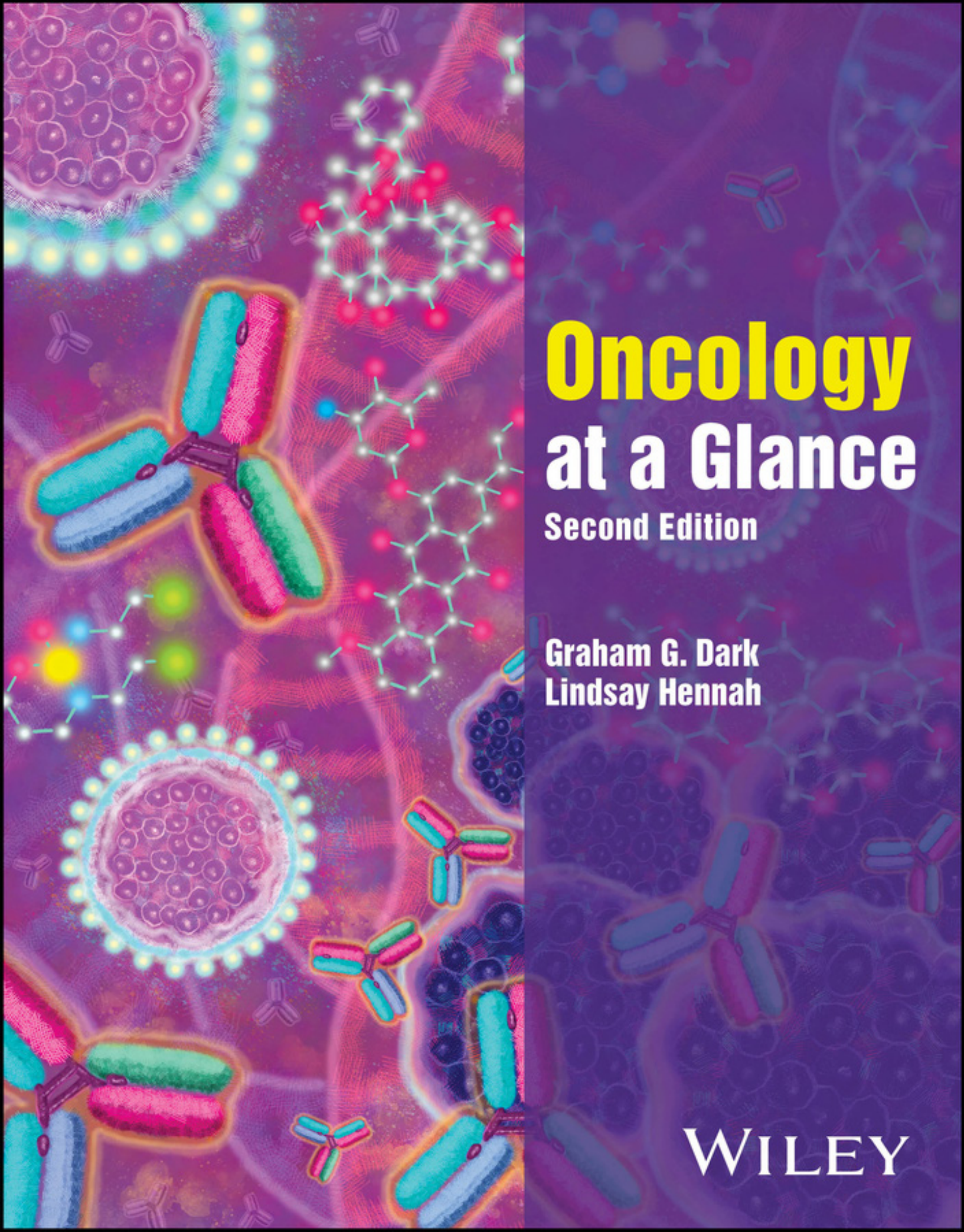
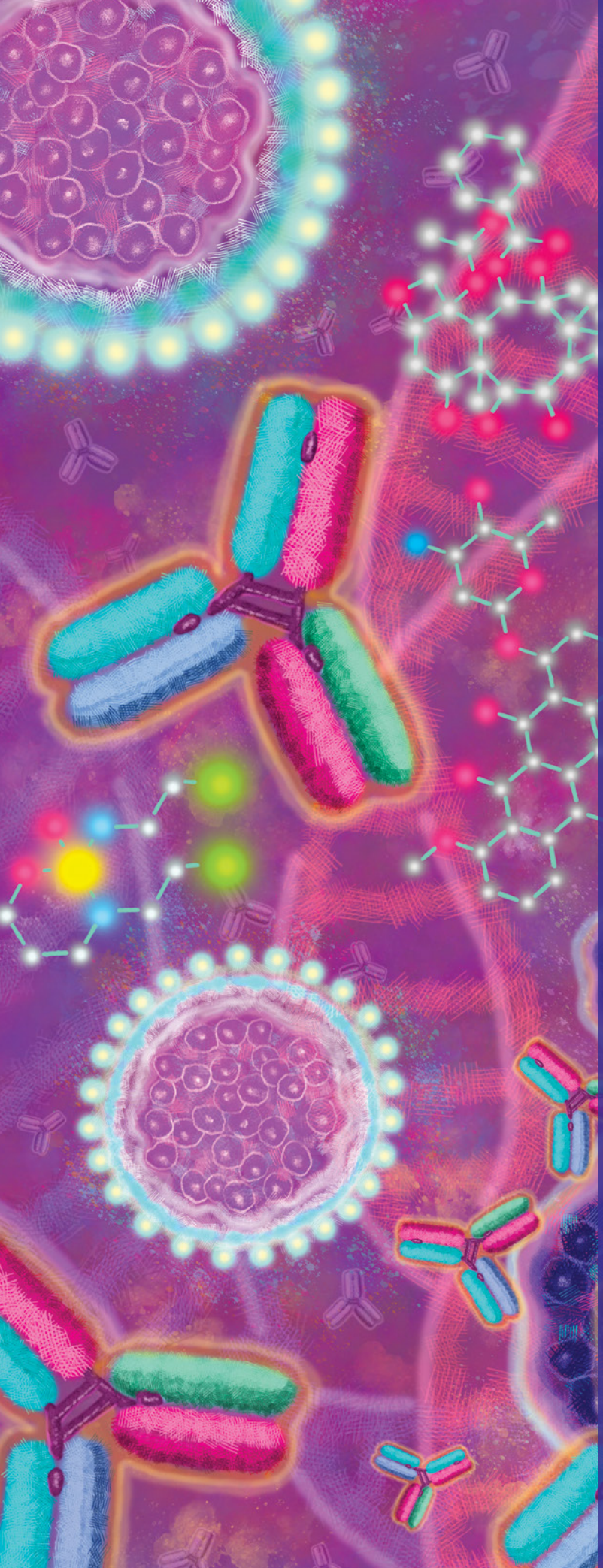


Oncology at a Glance

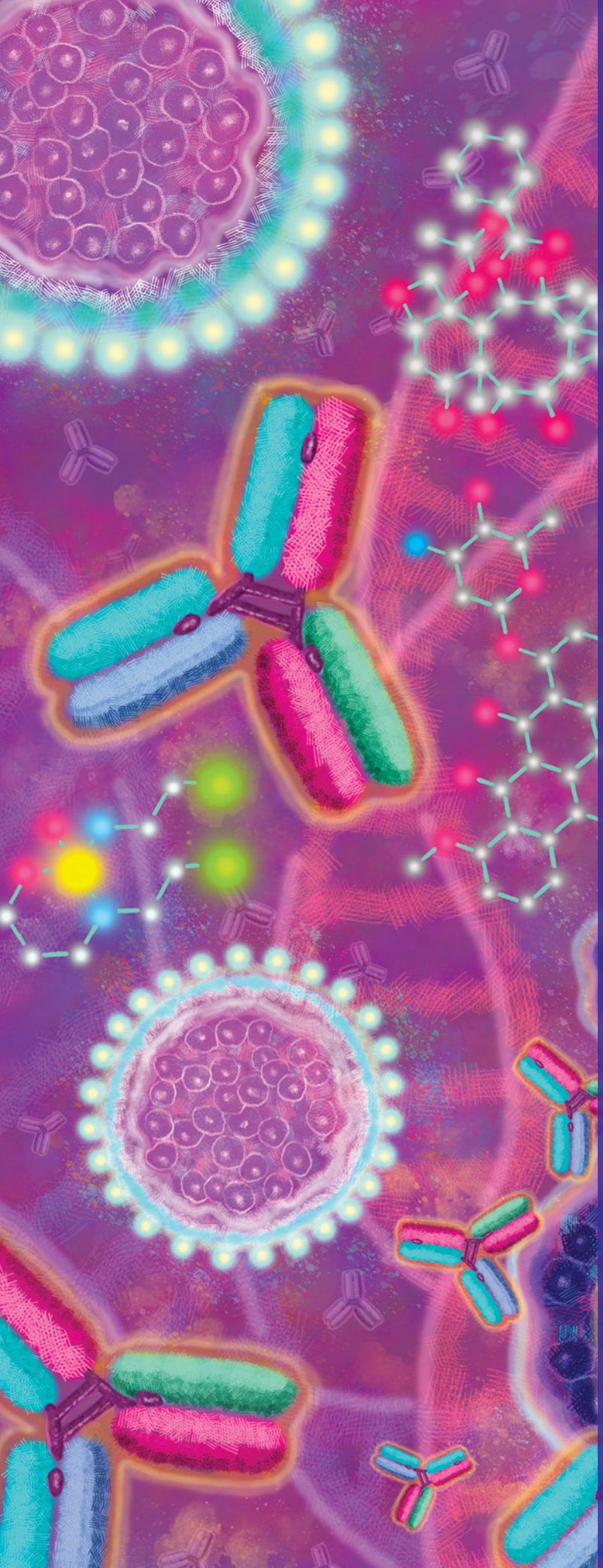
Second Edition

Graham G. Dark
Lindsay Hennah

WILEY



Oncology
at a Glance



Oncology at a Glance

Second Edition

Graham G. Dark
MBBS, FRCP, FHEA, FACP, FAACE, FEACE
Senior Lecturer in Cancer Education
Consultant in Medical Oncology
Department of Medical Oncology
Newcastle University
Freeman Hospital
Newcastle upon Tyne
NE7 7DN
UK

Lindsay Hennah
MBBS, BSc, MRCP
Specialist Registrar in Medical Oncology
Department of Medical Oncology
Freeman Hospital
Newcastle upon Tyne
NE7 7DN
UK

WILEY

This second edition first published 2025

Edition History
John Wiley & Sons Ltd (1e, 2013).

Registered Offices
John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, USA
John Wiley & Sons Ltd, New Era House, 8 Oldlands Way, Bognor Regis, West Sussex, PO22 9NQ, UK

For details of our global editorial offices, customer services, and more information about Wiley products visit us at www.wiley.com.

The manufacturer's authorized representative according to the EU General Product Safety Regulation is Wiley-VCH GmbH, Boschstr. 12, 69469 Weinheim, Germany, e-mail: Product_Safety@wiley.com.

Wiley also publishes its books in a variety of electronic formats and by print-on-demand. Some content that appears in standard print versions of this book may not be available in other formats.

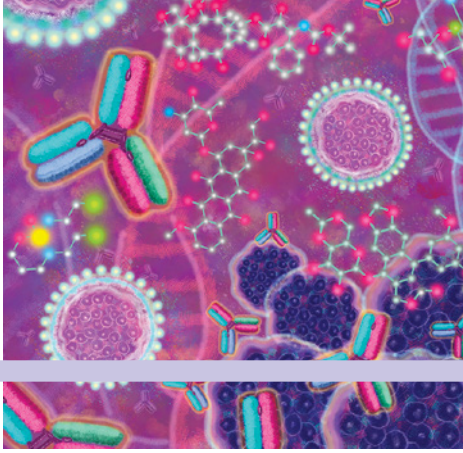
Library of Congress Cataloging-in-Publication Data applied for

PB ISBN: 9781394292691

Cover Design: Wiley
Cover Image: Courtesy of Dr. Divya Manoharan

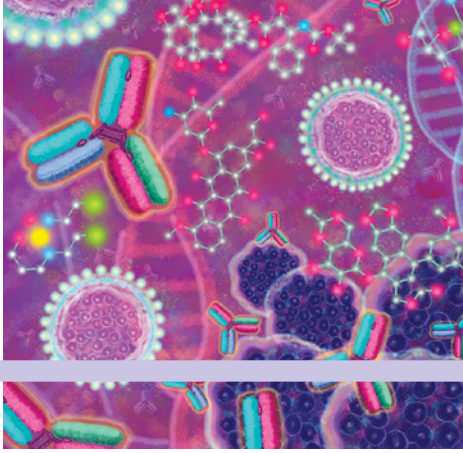
Set in 9.5/12.5pt MinionPro by Straive, Pondicherry, India

Contents



Part 3 Specific cancers 69

About the Authors



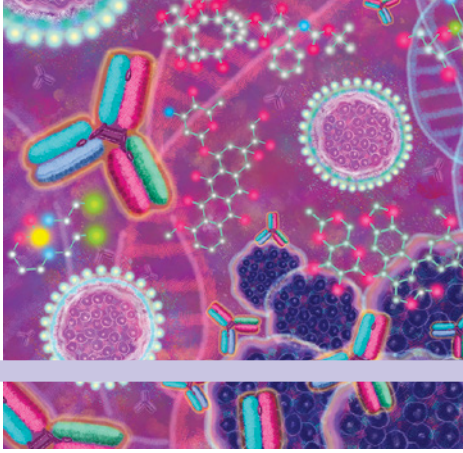
Graham G. Dark
MBBS, FRCP, FHEA, FACP, FAACE, FEACE
Senior Lecturer in Cancer Education
Consultant in Medical Oncology
Department of Medical Oncology
Newcastle University
Freeman Hospital
Newcastle upon Tyne
NE7 7DN
UK

Lindsay Hennah
MBBS, BSc, MRCP
Specialist Registrar in Medical Oncology
Department of Medical Oncology
Freeman Hospital
Newcastle upon Tyne
NE7 7DN
UK

Cover Art Title: Cellular Symphony of Malignancy
Artwork Modality: Apple iPad and Apple Pencil (Digital Artwork)
Artist: Dr. Divya Manoharan BMedSci (Hons), MB ChB (Edin.), MSc, MRCP(UK)
Specialty Resident in Clinical Oncology
Description:

The image was created with layers of cross hatching, soft glow, and paper texture brushes, complemented with double-stranded helix DNAs in the middle ground with matching range of colours in the background. The foreground has dark blue cells in the lower right corner, depicting cancer cells and symbolising the heinous and malicious nature of these feared cells. There are a few light and bright-coloured spiked immune cells floating around demonstrating their gatekeeping and combatant nature. The cancer cells are seen secreting tumour-specific antigens, whilst the immune cells are secreting cytokines. Biological agents and immunotherapy are key systemic anti-cancer treatments, which have been depicted by numerous circulating antibodies, representing monoclonal antibodies and checkpoint inhibitors. Lastly, there are chemical structures of agents from the six key chemotherapeutic classes; taxanes (Docetaxel), topoisomerase inhibitors (Etoposide), antimetabolites (Gemcitabine), alkylating agents (Ifosfamide), anti-tumour antibiotics (Epirubicin), and platinums (Oxaliplatin).

Preface



Oncology is a discipline that embraces a number of scientific fields. It is at the cutting edge of technology with regard to developments in therapeutic approaches. It is a stimulating and intellectual challenge to not only deliver the therapies of today but to research and develop the treatments of tomorrow. Research is embedded within the specialties and reflects the origins within academic departments. The delivery of high quality chemotherapy and radiotherapy services is an important political target and there has been considerable financial investment by the government in expanding cancer services in the UK.

For the undergraduate medical student, oncology can be overwhelming and often the exposure to patients with cancer can be quite fragmented in the undergraduate curriculum. Most student rotations will focus on the diagnostic processes as patients with cancer present to general medical and surgical firms, possibly as acute admissions or via outpatients with a variety of presenting symptoms. Other schools will provide specific rotations in the oncology department and this text is to provide the core knowledge to underpin such a learning experience.

The clinical practice of oncology is the application of a foundation of sciences including; *anatomy*, to interpret radiological imaging; *physiology*, for the impact of a multisystem disease; *pharmacology*, to design, deliver and monitor systemic anticancer treatments; *molecular biology*, for the development of viable targets of therapy and to understand the mechanisms of carcinogenesis, genetic risk and resistance to therapy; *cell biology*, the process of metastasis, vascular invasion, and microenvironment of the tumour and how this can affect outcome and approaches to therapy; *pathology*, to recognise the features of a disease that can affect all systems of the body.

Oncology is therefore the clinical application of the knowledge of science that underpins so much of clinical medicine and does so in a very evidence-based manner. This requires clarity of understanding, a fastidious approach to investigation of the patient to obtain a diagnosis and effective communication with the patient, their family and others within the multidisciplinary team. There are frequent challenges as sometimes the investigations do not produce a definitive answer and yet a clear plan of management is required for the benefit of the patient.

For many, oncology seems like a depressing specialty and yet there is so much reward for those involved in the care of complex patients. The satisfaction of demonstrating clinical improvement after the intellectual challenge of getting the right diagnosis, planning the right treatment, given the context of the patient and their disease, having communicated understanding to the patient to explain what is likely to happen in the future and having had opportunity to address their concerns and fears, is a reward for many clinicians involved in the management of patients with complex problems, especially those with cancer.

The origins of **Medical Oncology** as a specialty lie in the management of haematological and paediatric malignancies. It began as a small research orientated specialty and clinical research remains an important feature of the specialty. Over the last 20 years, enormous developments have taken place in the medical management of cancer, particularly in the development of therapies for common solid tumours. Today, Medical Oncology is a broad-based clinical specialty. It ensures that for common cancers, state-of-the-art therapies of established efficacy are delivered on a national basis, within a framework of care, tailored for the patient as an individual. Medical oncologists increasingly see patients at the beginning of their cancer journey for consideration of adjuvant and neoadjuvant therapies. They work as part of a multidisciplinary team and are able to advise on all aspects of oncological treatment including its integration with surgery and radiotherapy as well as having the skills to deliver specialist medical therapy.

Clinical Oncology arose from the discovery of radiation and therapeutic irradiation but most practitioners also deliver chemotherapy. In recent years there have been considerable technological advances in the delivery of radiation treatment with intensity modulation, photon therapy and stereotactic radiotherapy and some consultants focus on delivering specialised radiotherapy only.

New anticancer treatments are constantly in development by clinicians that are working at the interface between the clinic and the scientific foundations of knowledge. There is therefore opportunity for individuals to develop an academic career as a clinician scientist, with an interest in translational research that interfaces the scientific laboratory with the clinic.

This book is aimed at undergraduate students that will encounter patients with cancer throughout their clinical training and junior rotations. In some centres there may be minimal opportunity to study within the oncology departments as clinical experience may be gained with the teams that refer patients to a multidisciplinary team, rather than with the oncologists that deliver the subsequent treatment.

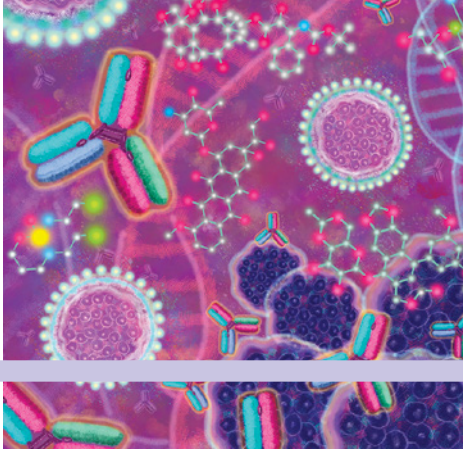
In some medical schools, students will have opportunity to undertake a student selected component (SSC). This is a period that allows personal learning outcomes to be defined and for individual students to explore either the depth or breadth of oncology practice. During one such period an informal discussion about learning resources resulted in the concept and idea of this book. A student focus group was used to identify the topics for inclusion and considerable attention was given to what is important for an undergraduate. Therefore some topics are left out by intention as they were not relevant to such an audience.

We have made considerable effort to ensure that this text remains appropriate for students and delivers the core knowledge required. We are grateful to the student reviewers for their attention to detail and for providing constructive comments that have improved the content and allowed the project to remain focused.

This book is not a detailed reference text about cancer but instead has been written to provide a basic foundation of knowledge to underpin successful clinical training in cancer medicine for undergraduates of medicine and for others working inoncology such as junior doctors and allied health professionals, to provide an understanding of the principles of treatment approaches used for common cancers in oncology practice.

Graham G. Dark
Lindsay Hennah

Abbreviations



5-HIAA	5-hydroxyindoleacetic acid
5-HT	5-hydroxytryptamine (serotonin)
5-HTP	5-hydroxytryptophan
ACCS	acute common core stem
ACE	angiotensin converting enzyme
ACTH	adrenocorticotrophic hormone
ADH	antidiuretic hormone or vasopressin
ADT	androgen deprivation therapy
AFP	alpha feto-protein
ALK	anaplastic lymphoma kinase
ALL	acute lymphoblastic leukaemia
AML	acute myeloid leukaemia
AOS	acute oncology service
ARCP	annual review of competency progression
ATG	antithymocyte globulin
aTNM	autopsy classification of stage
ATP	adenosine triphosphate
BCC	basal cell carcinoma
BCG	Bacillus Calmette–Guérin
BEP	bleomycin, etoposide, cisplatin chemotherapy
BMT	bone marrow transplant
BP	blood pressure
BSO	bilateral salpingo-oophorectomy
CACS	cancer anorexia and cachexia syndrome
CAR T	chimeric antigen receptor T-cell therapy
CCT	certificate of completed training
CD	cluster of differentiation
CDK	cyclin-dependent kinase
CEA	carcinoembryonic antigen
CHART	continuous hyperfractionated radiotherapy
CHRPE	congenital hypertrophy of the retinal pigment epithelium
CIN	cervical intraepithelial neoplasia
CINV	chemotherapy-induced nausea and vomiting
CIS	carcinoma in-situ
CLL	chronic lymphocytic leukaemia
CML	chronic myeloid leukaemia
CMT	core medical training
CNS	central nervous system
COCP	combined oral contraceptive pill
COX	cyclooxygenase
CR	complete response
CRP	C-reactive protein
CSF	cerebrospinal fluid
CT	computed tomography
CTC	common toxicity criteria
ctDNA	circulating tumour DNA
CTLA4	cytotoxic T-lymphocyte antigen 4
cTNM	clinical classification of stage
CTZ	chemoreceptor trigger zone
CUP	carcinoma of unknown primary
CVA	cerebrovascular accident
CXR	chest X-ray
DCIS	ductal carcinoma in situ
DLT	dose-limiting toxicity
dMMR	deficient mismatch repair
DNA	deoxyribonucleic acid
DRR	digitally reconstructed radiograph
DVT	deep vein thrombosis
EBV	Epstein-Barr virus
ECM	extracellular matrix
ECOG	Eastern Cooperative Oncology Group
EGFR	epidermal growth factor receptor
EM	electron microscopy
EMA	epithelial membrane antigen
EMT	epithelial-mesenchymal transformation
ENT	ear nose and throat
ER	oestrogen receptor/emergency room
ERCP	endoscopic retrograde cholangiopancreatography
ESMO	European Society for Medical Oncology
ESR	erythrocyte sedimentation rate
eV	electron volt
FAP	familial adenomatous polyposis
FBC	full blood count
FDG	fluorodeoxyglucose
FGF	fibroblast growth factor
FIGO	International Federation of Gynaecology and Obstetrics
FISH	fluorescent in-situ hybridisation
FIT	faecal immunochemical test
FNA	fine needle aspiration
FOB	faecal occult blood
FSH	follicle stimulating hormone
G-CSF	granulocyte-colony stimulating factor
GCT	germ cell tumour
GFR	glomerular filtration rate
GI	gastrointestinal
GIST	gastrointestinal stromal tumour
GU	genitourinary
Gy	Gray
HAD	hospital anxiety and depression scale
HBV	hepatitis B virus
HCC	hepatocellular carcinoma
hCG	human chorionic gonadotrophin
HCV	hepatitis C virus
HGF	hepatocyte growth factor

HHV	human herpes virus
HIV	human immunodeficiency virus
HNPCC	hereditary non-polyposis colorectal cancer
HOA	hypertrophic osteoarthropathy
HPV	human papilloma virus
HRT	hormone replacement therapy
HTLV-1	human T-cell lymphotrophic virus-1
ICP	intracranial pressure
ICPi	immune checkpoint inhibitor
IDA	iron deficiency anaemia
IGF	insulin-like growth factor
IHC	immunohistochemistry
IL	interleukin
IMRT	intensity modulated radiotherapy
IQ	intelligence quotient
IV	intravenous
IVC	inferior vena cava
JVP	jugular venous pressure
LCIS	lobular carcinoma in situ
LD	longest diameter
LDH	lactate dehydrogenase
LEMS	Lambert–Eaton myasthenic syndrome
LFT	liver function tests
LH	leutenising hormone
LHRH	luteinising hormone releasing hormone
mAb	monoclonal antibody
MALT	mucosa-associated lymphoid tissue
MAP	mitogen-activated protein
MDT	multidisciplinary team
MEN	multiple endocrine neoplasia
mIBG	meta-iodobenzylguanidine
MMF	mycophenolate
MMR	mismatch repair
MR/MRI	magnetic resonance imaging
MRCP	magnetic resonance cholangiopancreatography
MSCC	malignant spinal cord compression
MSU	mid stream urine
MTD	maximum tolerated dose
mTOR	mammalian target of rapamycin
NAFLD	non-alcoholic fatty liver disease
NER	nucleotide excision repair
NET	neuroendocrine tumour
NHL	non-Hodgkin lymphoma
NHS	National Health Service
NK-1	neurokinin-1
NOS	not otherwise specified
NSAID	non-steroidal anti-inflammatory drug
NSCLC	non-small cell lung cancer
NSE	neurone-specific enolase
NSGCT	non-seminomatous germ cell tumour
NTRK	neurotrophic tyrosine receptor kinase
OS	overall survival
PARP	poly (ADP-ribose) polymerase
PCOS	polycystic ovarian syndrome
PD	progressive disease
PD-1	programmed cell death 1
PDGF	platelet-derived growth factor
PD-L1	programmed cell death ligand 1
PE	pulmonary embolism
PEFR	peak expiratory flow rate
PEG	percutaneous endoscopic gastrostomy
PET	positron emission tomography
PFS	progression-free survival
PJP	Pneumocystis jirovecii pneumonia
PLAP	placental alkaline phosphatise
PMB	postmenopausal bleeding
pMMR	proficient mismatch repair
PR	progesterone receptor/per rectum/partial response
PS	performance status
PSA	prostate-specific antigen
PT	prothrombin time
PTH	parathyroid hormone
PTHrP	parathyroid hormone-related polypeptide
pTNM	pathological classification of stage
PTT	partial thromboplastin time
PV	per vagina
PVC	polyvinyl chloride
RCC	renal cell carcinoma
RECIST	response evaluation criteria in solid tumours
RNA	ribonucleic acid
RR	relative risk
rTNM	recurrent classification of stage
SCC	squamous cell carcinoma
SCF	supraclavicular fossa
SCLC	small cell lung cancer
SCT	stem cell transplant
SD	stable or static disease
SIAD	syndrome of inappropriate antidiuresis
SIRT	selective internal radiotherapy
SPECT	single photon emission computed tomography
SpR	specialist registrar
SVC	superior vena cava
SVCO	superior vena cava obstruction
TACE	trans-arterial chemoembolisation
TCC	transitional cell cancer
TENS	transcutaneous electrical nerve stimulation
TGF	transforming growth factor
TIL	tumour infiltrating lymphocyte
TKI	tyrosine kinase inhibitor
TLS	tumour lysis syndrome
TNBC	triple negative breast cancer
TNF	tumour necrosis factor
TSH	thyroid stimulating hormone
TSP-1	thrombospondin-1
TURBT	transurethral resection of bladder tumour
TURP	transurethral resection of the prostate
TYA	teenager and young adult
U&E	urea and electrolytes
UICC	Union for International Cancer Control
UK	United Kingdom
UMN	upper motor neurone
US	United States
UTI	urinary tract infection
UV	ultraviolet
VAT	video-assisted thoracoscopy
VEGF	vascular endothelial growth factor
VIP	vasoactive intestinal polypeptide
WHO	World Health Organization

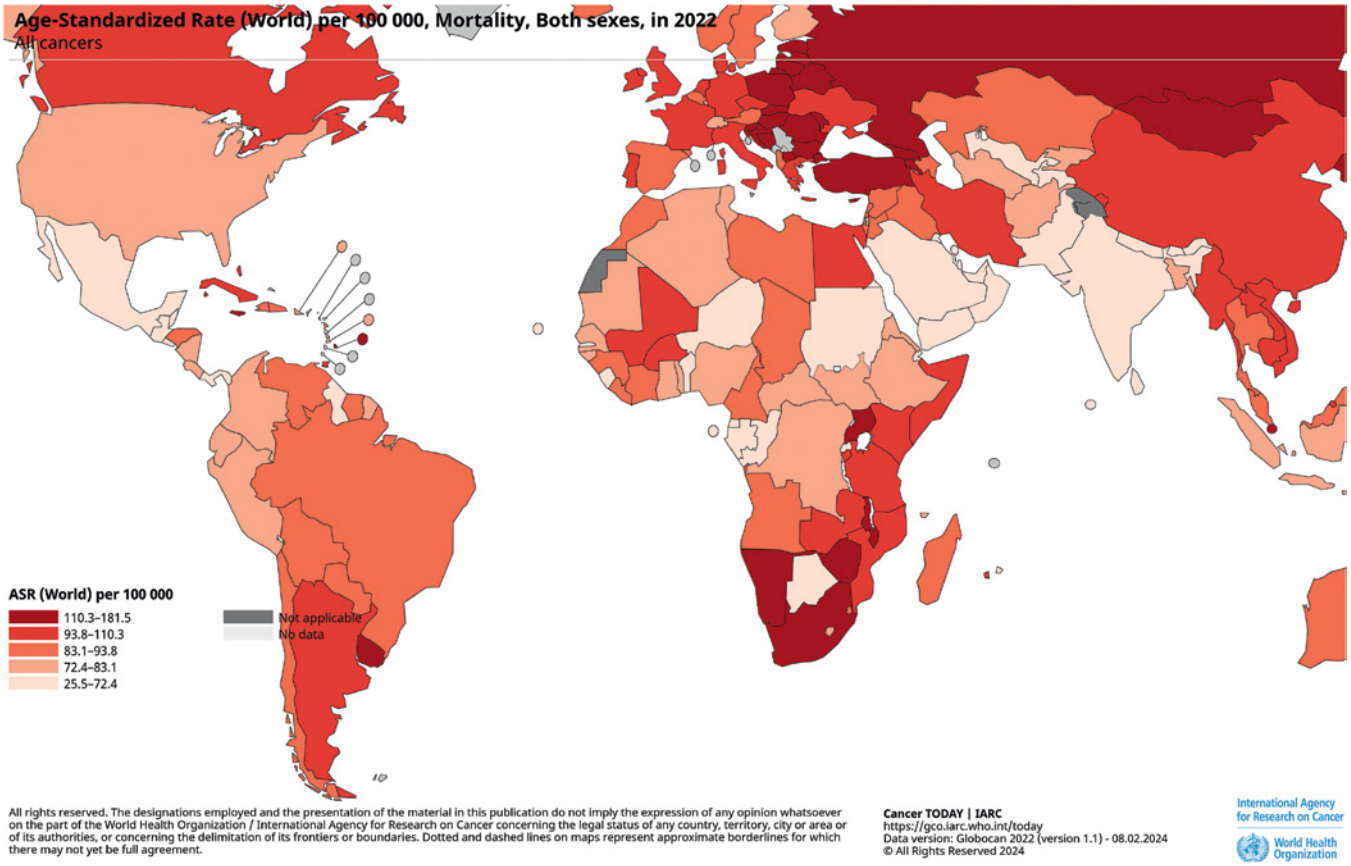
Scientific foundation of oncology

Part 1

Chapters

1 The global burden of cancer

Figure 1.1 Age-standardised mortality rate (world) per 100 000 (both sexes in 2022) (World Health Organization / https://gco.iarc.fr/today/en/dataviz/maps-heatmap?mode=population&types=1)



The global burden of cancer

Cancer represents a significant economic burden for the global economy and is now the third leading cause of death worldwide. By 2050, it is projected that there will be 35 million new cancer cases and 18 million cancer deaths per year.

The developing world is disproportionately affected by cancer and in 2008 developing nations accounted for 56% of new cancer cases and 75% of cancer deaths (Figure 1.1). These deaths happen in countries with limited or no access to treatment and with low per capita expenditure on healthcare. In recognition of this, the Union for International Cancer Control (UICC) conceived the World Cancer Declaration in 2008, with an update in 2013 showing there is progress in the majority of targets:

World cancer declaration (2013 update)

1 Strengthen health systems for effective cancer control
2 Measure cancer burden and impact of cancer plans in all countries
3 Reduce exposure to cancer risk factors
4 Universal coverage of HPV and HBV vaccination
5 Reduce stigma and dispel myths about cancer
6 Universal access to screening and early detection for cancer
7 Improve access to services across the cancer care continuum
8 Universal availability of pain control and distress management
9 Improve education and training of healthcare professionals

Developed and developing countries

Developing nations often do not have the funding, expertise or infrastructure to deliver effective cancer services. They may have limited or no cancer screening, few facilities and patients may have limited access to treatments and analgesia. The lowest-income countries have a survival rate of 25% compared to that of 56% in the wealthiest, discrepancies that have worsened following the COVID pandemic. Prevention is therefore a key strategy to reduce cancer deaths as it has the largest potential impact at the least expense.

Oncology at a Glance, Second Edition. Graham G. Dark and Lindsay Hennah.