Role of Pharmaceutical Personnel In Tumor Board: Closing the Gap of Cancer Care

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[pharmacozimbwe]

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Supporter

The class and presentation is supported by

- Primrose Pharmaceuticals ltd and, Dodoma, Tanzania
- Denovo Pharmacy

Target Audience

Pharmacozimbwe Class is designed to meet the clinical training needs for pharmaceutical personnel and other health care professionals who manage patients illness.

Biography

Zimbwe Kauke Bakari, a Haemato-Onco-Clinical Pharmacist in the Oncology Department and the Head of Pharmacy and Compounding Department at the Benjamin Mkapa Hospital, Dodoma, Tanzania and an AMU/C Surveillance-Human Health Fleming Fellow.

Holds Masters of Pharmacy in Hospital and Clinical Pharmacy from the Muhimbili University of Health and Allied Sciences and a Bachelor's degree in Pharmacy from St. John University of Tanzania. Served as a clinical pharmacist notably at Ocean Road Cancer Institute. He worked as a part-time Tutorial Assistant at Muhimbili University-School Allied Sciences and the University of Dodoma, as Assistant Lecturer at St. Augustine University in Tanzania.

He is a member of the National Medicine and Therapeutics Committee. He participated in the preparation of Standard Treatment Guidelines and Essential Drug List, 2021 and Medicine Policy Guidelines, 2021. Participated in preparation of Hospital Formulary, Hospital Therapeutics Committees, Ethical Prescribing and Dispensing and Standard Treatment Guideline and Essential Medicine List training package materials. Coordinate and is a principal auditor of the Benjamin Mkapa Hospital Formulary, 1st edition, 2021. Take part in Technical Team and Consultant advisor on National Pharmaceutical Action Plan, 2021-2026 formulation, for Tanzania Mainland, MOH (on progress). Zimbwe is a member of National Technical Working Group of antimicrobial stewardship to review national antimicrobial resistance action plan, 2022-2027.

He is committed Clinical Pharmacist, having a better understanding of infectious disease control and rational antimicrobial use. Zimbwe is certified by the Pharmacy Council, a member of the Pharmaceutical Society of Tanzania, Tanzania Oncology Society, International Society of Paediatrics Oncology-Africa, International Society of Paediatrics Oncology-Global, International Society of Oncology Pharmacy Practitioners, Society for Immunotherapy of Cancer, National Comprehensive Cancer Network and Africa Palliative Care Association.

He is an expert in solid and hematologic malignancies, chemotherapy and provide pharmaceutical care to oncology patients, assisting in the optimization of patient outcomes. Responsible to evaluate medication orders, prescriptions, and treatment plans received by authorized prescribers for safety, accuracy, and appropriateness. Provides pharmaceutical education to patients, family members, and other health care professionals and serves as a resource to the interdisciplinary team for medication-related information and issues at institution and national level. The expert and pharmacy focal person of planned Bone marrow transplants program at the Benjamin Mkapa Hospital which will be launched soon.

Disclosure Information

1. Clinical Pharmacist, Haemato-Oncology Expert, BMT Pharmacy The Benjamin Mkapa Hospital
2. Fleming Fund AMU/C Surveillance – Human Health Fellow
3. MD Primrose Pharmaceutical, Dodoma Tanzania
4. Chairman Denovo Pharmacy

I have no relevant financial relationships to disclose as it relates to the content of this presentation.

Class Details

Purpose

To comprehend role of oncology pharmaceutical personnel in Tumor Board

Learning Objectives

1. To understand significance of multidisciplinary team roles in cancer care
2. To understand the composition of TB and
3. To understand roles of TB members
4. To understand roles of pharmaceutical personnel in TB

Presentation outline

- Introduction of cancer therapeutics
- Therapeutic merits of Multidisciplinary Team/Tumor board (MDT/TB)
- Tumor board in cancer care
- Roles of a pharmaceutical personnel in tumor board
- Recommendations

Cancer Therapeutics

- Cancer care is a complex path: requires collaboration, complementary skills, experience, expertise and communication among professionals
- Cancer is seldom detected, diagnosed, and adequately treated by a single physician or discipline; a multidisciplinary approach is required [1]
- Advancement: technological, disease complexity, medications diverse, treatment personalization(target/precision, tumor biology/molecular and radiation therapy) necessity expert collaboration
- **Scientific evidence demonstrates that cancer care should be delivered through multidisciplinary team (MDT) interventions [2].**

1. El Saghir NS, Charara RN, Kreidieh FY, et al: Global practice and efficiency of multidisciplinary tumor boards: Results of an American Society of Clinical Oncology international survey. J Glob Oncol 1:57-64, 2015

2. Kesson EM, Allardice GM, George WD, Burns HJ, Morrison DS. Effects of multidisciplinary team working on breast cancer survival: retrospective, comparative, interventional cohort study of 13722 women. BMJ. 2012;344:e2718.

Cancer Therapeutics……2

- A MDT: composed of professionals from different clinical specialties who work together to make decisions about the recommended clinical pathway of an individual patient [3, 4].
- MDT provide: **provisional dx, definite dx, deferential dx, investigations (clinical, labs, imaging) treatment plan, treatment options, treatment reconciliation, TDM and appropriate follow-up.**
- It consequently improves the healthcare system and its experience for both patients and professionals, particularly concerning oncological diseases [2, 5, 6].

2• Kesson EM, Allardice GM, George WD, Burns HJ, Morrison DS. Effects of multidisciplinary team working on breast cancer survival: retrospective, comparative, interventional cohort study of 13722 women. BMJ. 2012;344:e2718.

3. National Health Service Data Model and Dictionary Version 3. NHS Business definition. https://www.datadictionary.nhs.uk/data_dictionary/nhs_business_definitions/m/multidisciplinary_team_de.asp?shownav=1. Accessed 12 Jul 2019.

4.Lesslie M, Parikh JR. Implementing a Multidisciplinary Tumor Board in the Community Practice Setting. Diagnostic (Basel). 2017;7(4). https://doi.org/10. 3390/diagnostics7040055.

5. Taylor C, Munro AJ, Glynne-Jones R, Griffith C, Trevatt P, Richards M, et al. Multidisciplinary team working in cancer: what is the evidence? BMJ. 2010; 340:c951.

6. Fleissig AJ, Jenkins V, Catt S, Fallowfield L. Multidisciplinary teams in cancer care: are they effective in the UK? Lancet Oncol. 2006;7(11):935–43.

Cancer Therapeutics……3

- MDT for oncological patients care is **TUMOR BOARD, TB**
- Previously, TBs: advise and assist physicians on clinical management and on care decision.
- A TB was only called at one point in patient management time, not during the entire staging and treatment pathway, and the patient was rarely present [7].
- Over time, TBs include: rehabilitation, psychosocial needs and long-term care, patients could also be present at the meetings and his/her consensus is sought throughout the duration of the treatment process.
- In addition, treatment decisions and clinical responsibility are shared by the members of the TB.
- More recently, virtual TB conducted [7]. As myself I attend virtual monthly TB by NCCN

7. Fennell ML, Das IP, Clauser S, Petrelli N, Salner A. The Organization of Multidisciplinary Care Teams: modeling internal and external influences on Cancer care quality. J Natl Cancer Inst Monogr. 2010;40:72–80.

MDT/TB Therapeutics Merits

- Ensure patient diagnostic accuracy, staging accuracy, and overall survival MTB/MDT meetings bring together physicians from different disciplines (oncologists, radiologists, surgeons, pathologists) and various members of the health care team who are involved in a patient's care, for inter- and intradisciplinary discussions.
- Reliable and adequate planning of necessary diagnostics or treatment[8-12]
- **Worldwide as standard for the management of patients with cancer.**

8. Kesson EM, Allardice GM, George WD, et al: Effects of multidisciplinary team working on breast cancer survival: Retrospective, comparative, interventional cohort study of 13 722 women. BMJ 344:e2718, 2012

9. Stephens MR, Lewis WG, Brewster AE, et al: Multidisciplinary team management is associated with improved outcomes after surgery for esophageal cancer. Dis Esophagus 19:164-171, 2006

10. Davies AR, Deans DA, Penman I, et al: The multidisciplinary team meeting improves staging accuracy and treatment selection for gastro-esophageal cancer. Dis Esophagus 19:496-503, 2006

11. Junor EJ, Hole DJ, Gillis CR: Management of ovarian cancer: Referral to a multidisciplinary team matters. Br J Cancer 70:363-370, 1994

12. Pan CC, Kung PT, Wang YH, et al: Effects of multidisciplinary team care on the survival of patients with different stages of non-small cell lung cancer: A nationalcohort study. PLoS One 10:e0126547, 2015

MDT/TB Therapeutics Merits…2

- Decisions made conform with evidence based guidelines, multimodal treatments with standardizing and improving outcomes [12].
- Define appropriate management, facilitate communication, analyse of treatment results, and provide prognostic parameters[13-16]

12. Croke JM, El-Sayed S: Multidisciplinary management of cancer patients: Chasing a shadow or real value? An overview of the literature. Curr Oncol 19:e232-e238, 2012

13. Deressa BT, Cihoric N, Tefesse E, Assefa M, Zemenfes D. Multidisciplinary Cancer Management of Colorectal Cancer in Tikur Anbessa Specialized Hospital, Ethiopia. J Glob Oncol. 2019 Oct;5:1-7. doi: 10.1200/JGO.19.00014. PMID: 31589543; PMCID: PMC6825246.

14. Benson AB III, Venook AP, Cederquist L, et al: Colon Cancer, Version 1.2017, NCCN Clinical Practice Guidelines in Oncology. J Natl Compr Canc Netw 15:370-398, 2017

15. Benson AB III, Venook AP, Bekaii-Saab T, et al: Rectal Cancer, Version 2.2015. J Natl Compr Canc Netw 13:719-728, quiz 728, 2015

16. Fielding LP, Arsenault PA, Chapuis PH, et al: Clinicopathological staging for colorectal cancer: An international documentation system (IDS) and an international comprehensive anatomical terminology (ICAT). J Gastroenterol Hepatol 6:325-344, 19

Tumor Boards in Cancer Care

- Multidisciplinary team (MDT) meetings or tumor boards (TBs) are fundamental components of cancer treatment planning, aimed improved outcomes.
- Looks a patient's case from different perspectives is an essential part of deciding the **best treatment approach**.
- TB decide: options (surgery, chemotherapy, or radiation, as well as clinical trials.
- **Universal standard for cancer care**

Tumor Boards Sorts

- Goal: to decide on the best possible diagnosis, treatment and management plan for a neoplasm
- One general tumor board: small hospital
- Multiple tumor boards: larger hospital
  - Lung Cancer Tumor Board
  - Gastrointestinal Cancer Tumor Board
  - Head & Neck Tumor Board
  - Haematological Malignancies Tumor Board
  - Gynaecological Malignancies Tumor Board
  - Prostate/Testicular/Penis Tumor Board
  - Molecular tumor boards (MTB)
  - Pharmaceutical Personnel Tumor Board
- TB formal meetings usually held regularly, often on a weekly basis

Tumor Board Members

- TB size: hospital size, hospital number, cancer type, number of professionals eligible to participate
  - Medical oncologist
  - Radiation oncologists,
  - Surgeons
  - Radiologists
  - Pathologists
  - Nurse specialists
  - Nuclear medicine specialists,
  - Palliative medicine physicians,
  - Pharmaceutical experts
  - Psycho oncologists
  - Genetics counselors
  - Nutritionists
  - Plastic surgeons

17. National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Hepatobiliary Cancers; Version 3; National Comprehensive Cancer Network: Plymouth Meeting, PA, USA, 2017.

Levels of TB Members

1. **Core**: radiation and medical oncologists, oncology nurses, nuclear medicine specialists, radiologists, pathologists, oncology pharmaceutical personnel, medical physicists
2. **Allied**: surgeons, palliative care physicians, head and neck specialists, respiratory disease physicians, gastrointestinal disease physicians and anaesthesiologists;
3. **Support**: psychologists, nutritionists, dieticians, plastic surgeons, speech therapists, patients' GPs, physiotherapists, practitioners of complementary medicine, orthopaedic specialists, odontologists, faith counsellors, biologists, data managers, genetic counsellors, hospital pharmacists, social workers and occupational therapists.

18. Prades J, Remue E, van Hoof E, Borras JM. Is it worth reorganising cancer services on the basis of multidisciplinary teams (MDTs)? A systematic review of the objectives and organisation of MDTs and their impact on patient outcomes. Health Policy. 2015;119(4):464 –7

TB: Closing the Gap of Cancer Care

- All members of the TB were important contributors: case preparation, presentation, discussion, and the making of management plans.
- The TB discussion: training platform for oncology practitioners, an asset to the hospital and to the community.
- Ameliorate inter/intradepartmental relationships, joint research and clinical trials.
- Improves decision making, patient care coordination, and it reduces waiting times
- The cancer patients: access to the best current cancer management.
- TB provides educational, quality assurance, and legal mechanisms to deliver state-of-the-art care.

19. Gross GE. The role of the tumor board in a community hospital. CA Cancer J Clin. 1987 Mar-Apr;37(2):88-92. doi: 10.3322/canjclin.37.2.88. PMID: 3102006.

20. Specchia ML, Frisicale EM, Carini E, Di Pilla A, Cappa D, Barbara A, et al. The impact of tumor board on cancer care: Evidence from an umbrella review. BMC Health Serv Res. 2020;20(1):1–14.

TB: Cancer Case Presentation

- **A prospective case presentation:** gathers the collaborating specialists formally at scheduled times in order to review individual cancer patients in a pragmatic way using an evidence-based approach, to discuss diagnosis and formulate future treatment and management plans [20].
- **A retrospective case presentation:** consists of a multidisciplinary discussion of cases with an educational aim, to assess in a multi-professional environment whether the decisions taken for the patient's management were optimal in an effort to inform and educate the treating physicians in hopes of improving care for future cases [21].

20. Lesslie M, Parikh JR. Implementing a Multidisciplinary Tumor Board in the Community Practice Setting. Diagnostic (Basel). 2017;7(4). https://doi.org/10. 3390/diagnostics7040055.

21. American College of Surgeons/Commission on Cancer. Cancer Program Standards 2012: Ensuring Patient-Centered Care V1.2.1. Chicago: American College of Surgeons; 2011.

TB: Encounters

- It requires care coordination
- Effective decision-making
- Good communication
- Multidisciplinary collaboration
- The active participation of stakeholders including patients and all professionals

The aforementioned factors should be addressed by healthcare managers(EDs/MOIs/MoH/professional councils) to improve teamwork within their organizations

22. Specchia ML, Frisicale EM, Carini E, Di Pilla A, Cappa D, Barbara A, et al. The impact of tumor board on cancer care: Evidence from an umbrella review. BMC Health Serv Res. 2020;20(1):1–14.

“It gives multiple second opinions instantly,” Rubin said. “If you talk something over with six, eight, or 10 people, you might come up with things that an individual may not think of. Overall, this translates to a much more considered, thoughtful and robust treatment plan for patients.”

Oncology Pharmaceutical Personnel

ROLES IN TUMOR BOARD

Oncology Pharmaceutical Personnel roles in tumor board

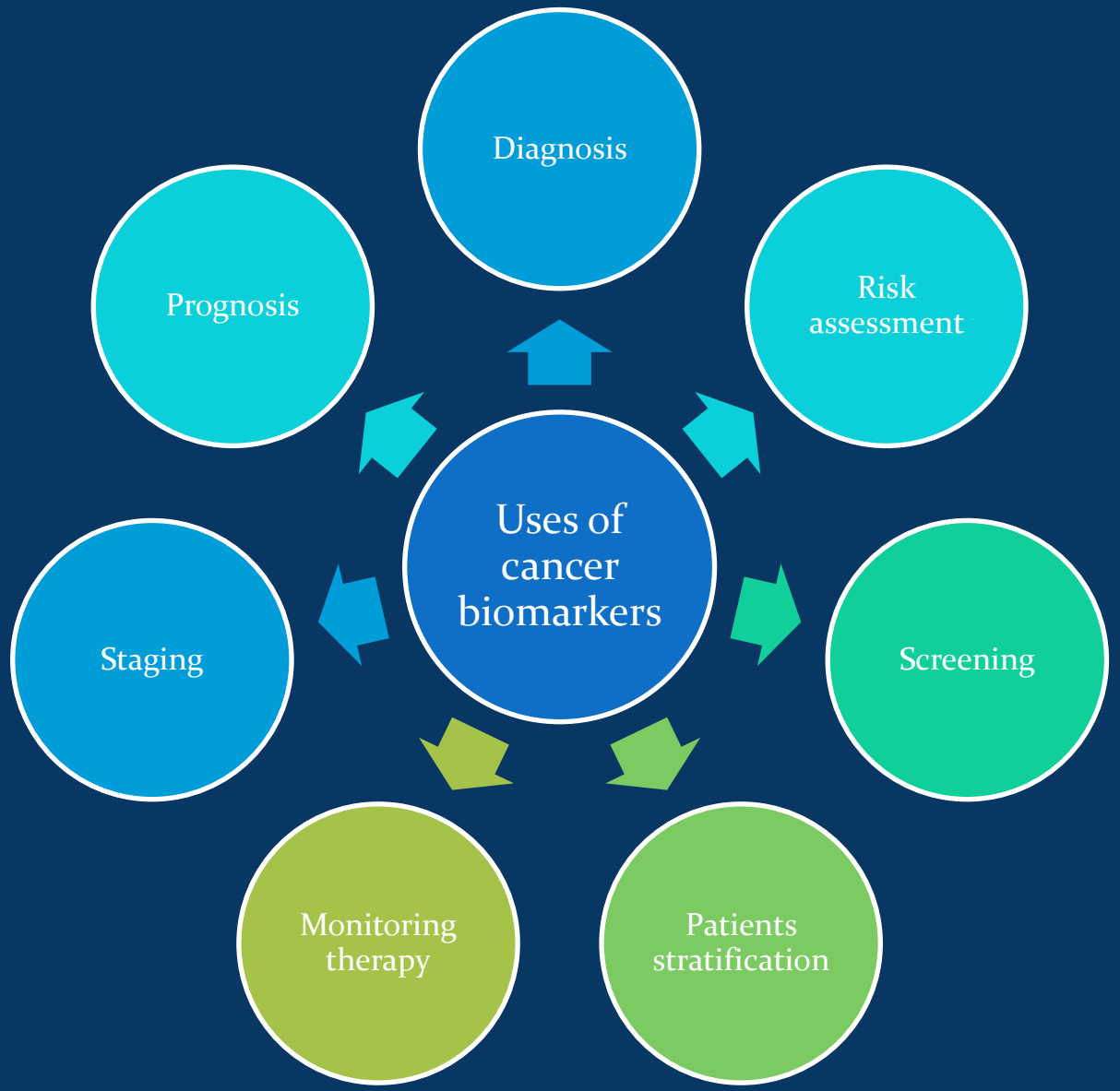
- Ensure availability, accessibility of quality, efficacious, safety and cost effective of cancer medicines.
- Participate on cancer treatment individualization, regimen selection, treatment planning: chemotherapy, radiopharmaceuticals.
- Advise on preference lines(1st, 2nd and 3rd), cycle for treatment and palliation
- Anticipate on chemotherapy and radiopharmaceuticals ADRs/IRRs suggest and ensure treatment plans.
- Follow the care plan process and monitoring the patient response.

Oncology Pharmaceutical Personnel Precision Genomics Program

Precision Genomics Program in Molecular TB

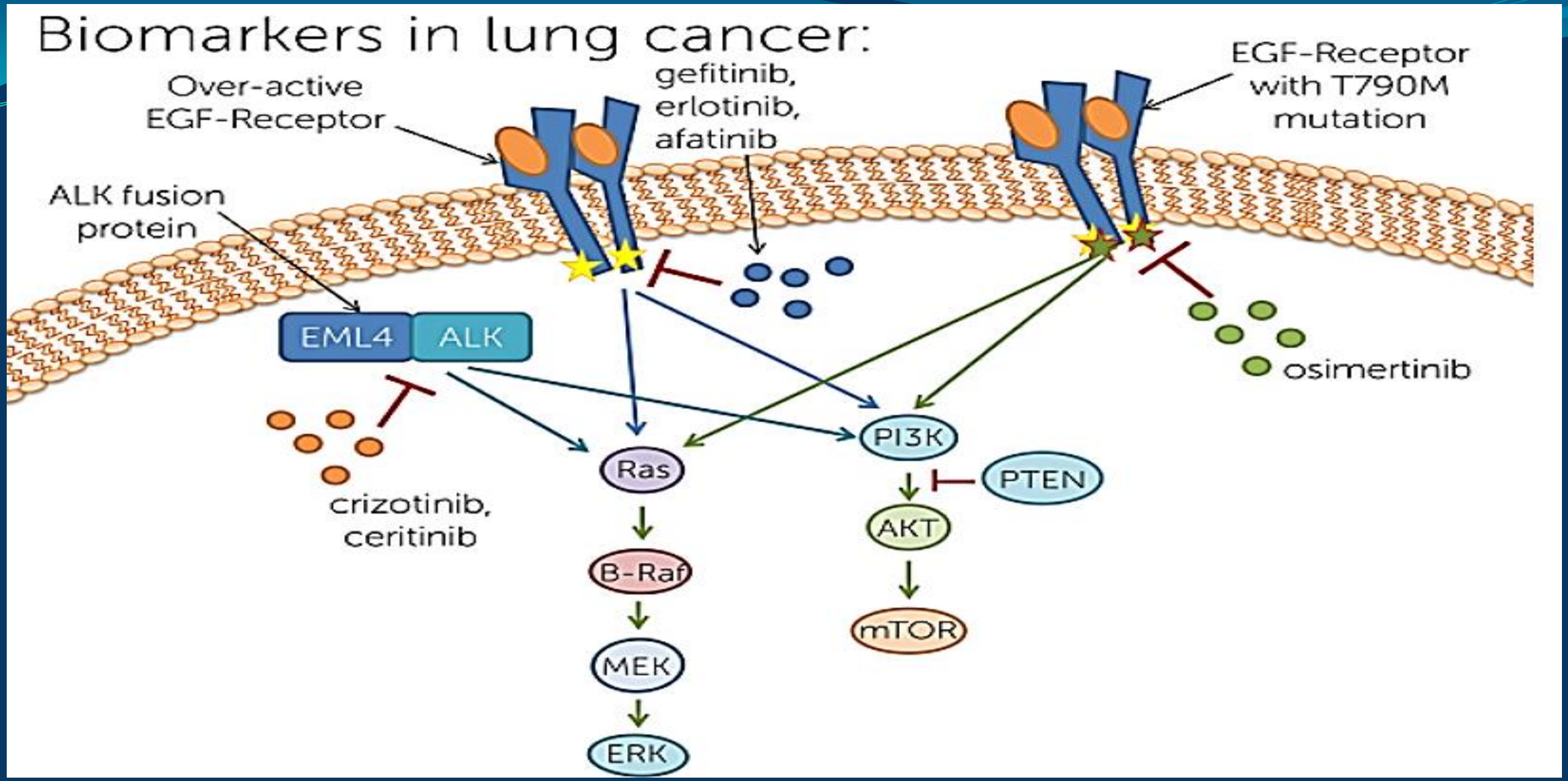
- Targeted therapies[biologics, hormonal therapy, small substances]: mechanism of action, dose, administration, side effects, drug interactions, and treatment recommendations
- Pharmacogenomics [~omics~] integration impacts: studies have affected dosing in certain antineoplastic.
- Cancer biomarker/growth factors/growth receptors with tumor–node–metastasis (TNM) staging system guide online on treatment customization
- Down-expression/over-expression one of prognostic determinants

Clinical Uses of Cancer Biomarkers



Precision Lung Cancer Medicine

- EGFR (epidermal growth factor receptor) gene mutation predict that the cancer is likely to respond to an EGF Receptor-blocker (Tyrosine kinase inhibitors (TKIs)): erlotinib, gefitinib or afatinib
- T790M mutant version presence of EGF-Receptor gene predicts that the cancer is likely to respond to osimertinib.
- An anaplastic lymphoma kinase (ALK) gene rearrangement predicts that the cancer is likely to respond to crizotinib or ceritinib.
- Presence of VEGF predict the use of anti-VEGFR, bevacizumab
- Atezolizumab, nivolumab, and pembrolizumab: target the interaction between the programmed death-ligand 1 (PD-L1) and the programmed cell death protein 1 (PD-1) receptor.
- To predict the precise efficacy of pembrolizumab: determine the PD-L1 protein levels, CD8, Janus kinase 1 (JAK1), Janus kinase 2 (JAK2) and β2 microglobulin (B2M) expression.



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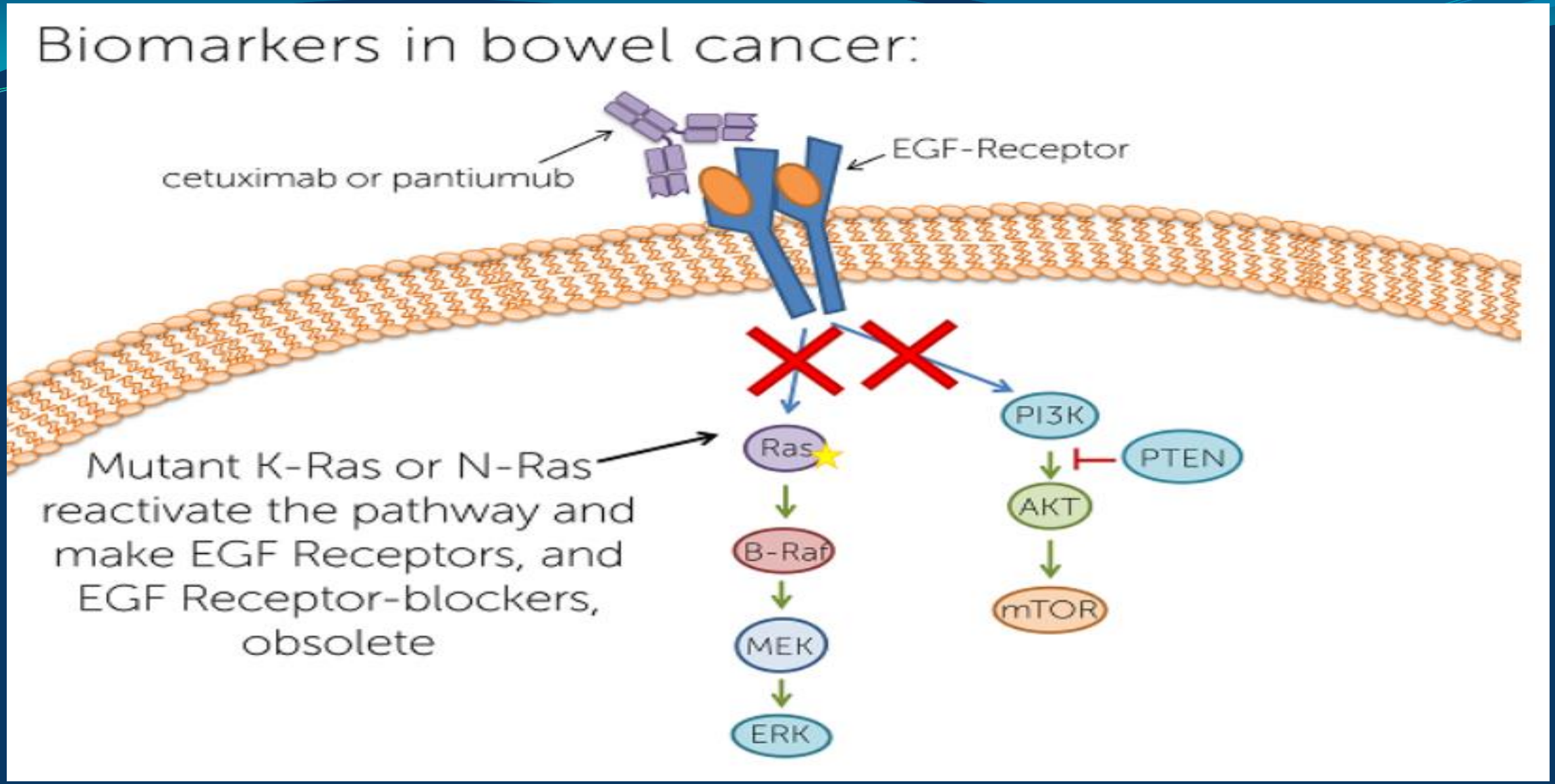
Precision Colorectal Cancer Medicine

- Anti-EGFR monoclonal antibodies cetuximab, panitumumab and anti-VEGF bevacizumab in combination with typical fluoropyrimidine-based regimens for EGFR/VEGFR +: FOLFOX, FOLFIR, CapeOx regimen
- Anti-VEGF bevacizumab with chemos, naïve & negati K-Ras/N-Ras gene mutation
- Cetuximab and panitumumab: FOLFIR refractory and advanced CRC and K-Ras & N-Ras gene mutations (B-Raf mutations also tend to predict resistance to cetuximab and panitumumab for similar reasons)
- Methylenetetrahydrofolate reductase (MTHFR) -1298 polymorphism can be a good predictor of patients response to adjuvant FOLFOX and CapeOx



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Precision Stomach/Gastric Cancer Medicine

- Liquid biopsy examining for circulating tumor cells (CTCs-stem cell-like properties) can be a crucial marker of gastric cancer stem cells can provide a suitable target for cancer diagnosis through nanobiosensor detection system.
- CTC: poor prognosis indicator in patients with stomach cancer and determining response to chemotherapy
- Gastric cancer: Chemo's-target therapy have treatment specific benefit
- Trastuzumab (HER2) + platinum-based chemo is the typical first-line regimen in HER2+ advanced stomach cancer
- New targeted agents, on clinical trials are now targeting mTOR, PD-1/PD-L1 et. pembrolizumab for PDL1–positive

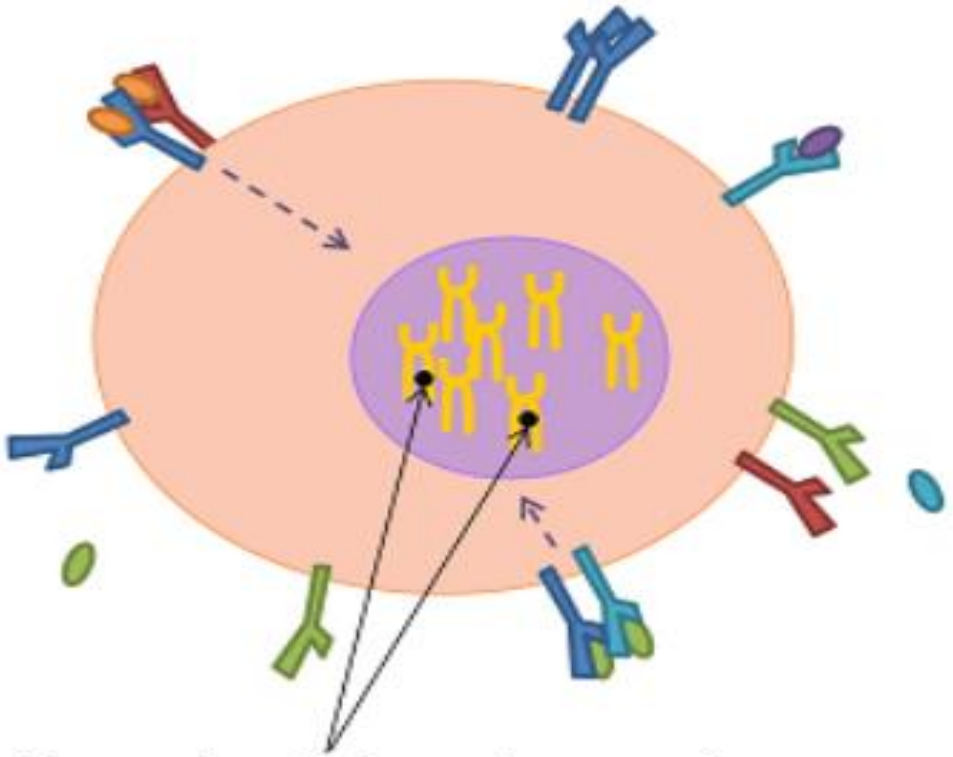
Precision Liver Cancer Medicine

- It is highly heterogeneous cancer, needs personalized medicine
- Serum AFP (alfa fetal protien) level together with imaging techniques: US, MRI, and CT, best for confirmatory dx
- TKIs have the excessive potential of HCC (hepatocellular carcinoma): targeting several GF and their associated signaling pathways like EGF/EGFR, VEGF/VEGFR, IGF/IGFR, PDGF, FGF, RAS/ RAF/ERK/MAPK, PI3K/AKT/ mTOR, Wnt/betacatenin
- Sorafenib: targets both Raf, VEGFR and PDGFR TK signaling
- Other TKIs like sunitinib, linifanib, brivanib, and regorafenib suppress a number of angiogenesis-related signaling pathways: VEGFR, PDGFR, and FGFR.

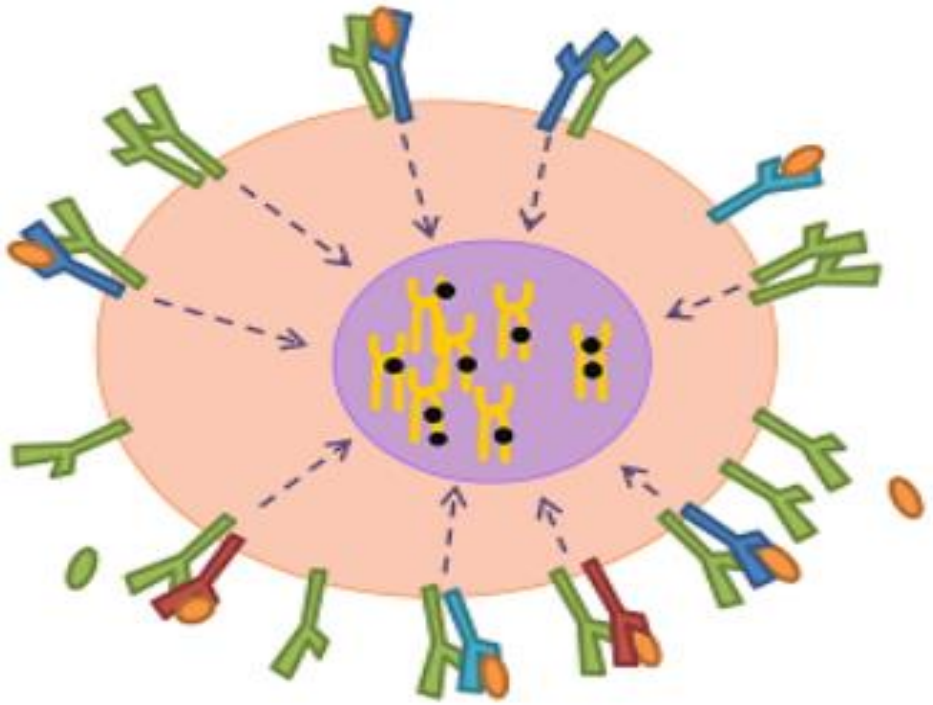
Precision Breast Cancer Medicine

- Breast cancer-associated biomarkers: ER, PR, Ki-67 and HER2
- ER: prognostic(ER- >poor prognosis and ER+>good prognosis) and predictive tissue biomarker (patients likely to respond to hormonal therapy), ER positive tumors, ER modulators(tamoxifen)/aromatase inhibitors (anastrozole) regardless of staging.
- Targeted therapy for HER-2 positive breast cancer patients: trastuzumab
- Trastuzumab: has been used for overexpressed HER2 metastatic breast cancer as first line
- Lapatinib for BCA brain met (EGFR and HER2)
- ER/PR in BCA, **European Society of Medical Oncology** recommend: predicting response to hormone therapy
- Urokinase plasminogen activator (uPA) & plasminogen activator inhibitor-1 (PAI-1) low level reduced risk of BCA recurrence
- Elevation of CA15.3, CEA, and BR 27-29 in conjugation with other tools of radiological and clinical assessments indicate recurrence or progression of the diseases

Biomarkers in breast cancer:



Normal cells have two copies of the HER2 gene



HER2 gene amplification leads to over-production of HER2 → increased activation of Ras, Raf, PI3K etc.

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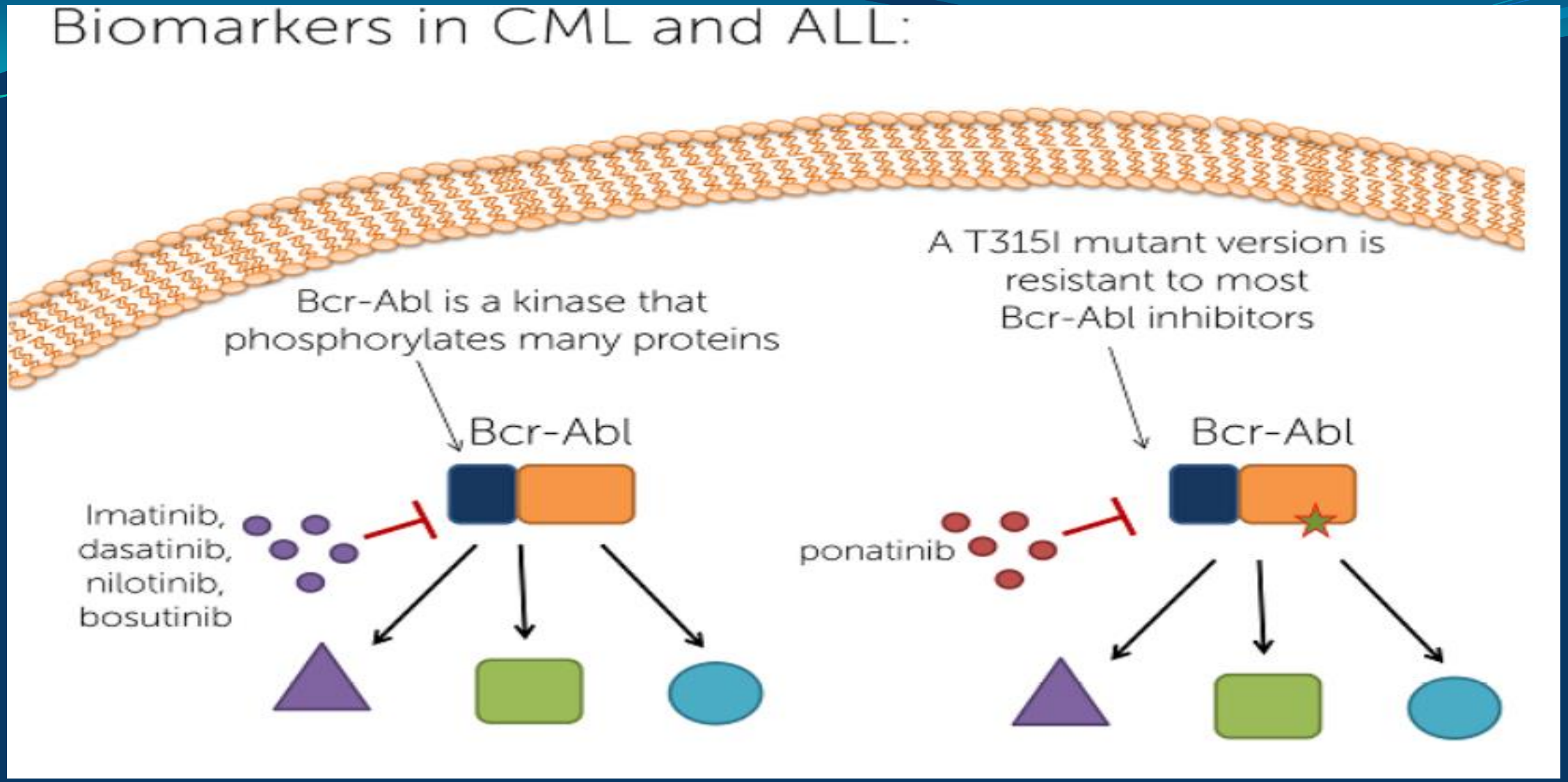
Precision Prostate Cancer Medicine

- PSA test: screening, diagnostic marker, discriminate between benign and malignant prostatic tumors in patients with PSA values ranging from 4 to 10 µg/L
- Genetic and epigenetic changes as the PCa hallmarks: over expressed androgen receptors and hyper-activated human castration-resistant prostate cancer (CRPC): (LHRH, goserelin and antiandrogen, bicalutamide) candidates
- Over-expressed androgen receptor plus bone metastasis: **abiraterone and enzalutamide**
- High level of drug efflux transporter genes: increased resistance to **docetaxel and paclitaxel but better respond to cabazitaxel**

Chronic Myeloid Leukaemia (CML) And Acute Lymphoblastic Leukaemia (ALL)

- Most CMLs , 25-40% of adults with ALL and 3-5% of children with ALL contain the (Philadelphia xsome): **BCR-ABL fusion protein and respond to a BCR-ABL inhibitor: imatinib, nilotinib, dasatinib, bosutinib.**
- **Imatinib** is the 1st line, if the shape of BCR-ABL'S ATP-binding site **changes and relapse, dasatinib, nilotinib, or ponatinib opted**
- BCR-ABL protein mutated called T3151 it is resistant to the BCR-ABL inhibitors, ponatinib is the best choice
- (*T3151 means that the 315th amino acid in the BCR-ABL protein is an isoleucine rather than the usual threonine)*

Philadelphia chromosome. A piece of chromosome 9 and a piece of chromosome 22 break off and trade places. The BCR-ABL gene is formed on chromosome 22 where the piece of chromosome 9 attaches. The changed chromosome 22 is called the Philadelphia chromosome.



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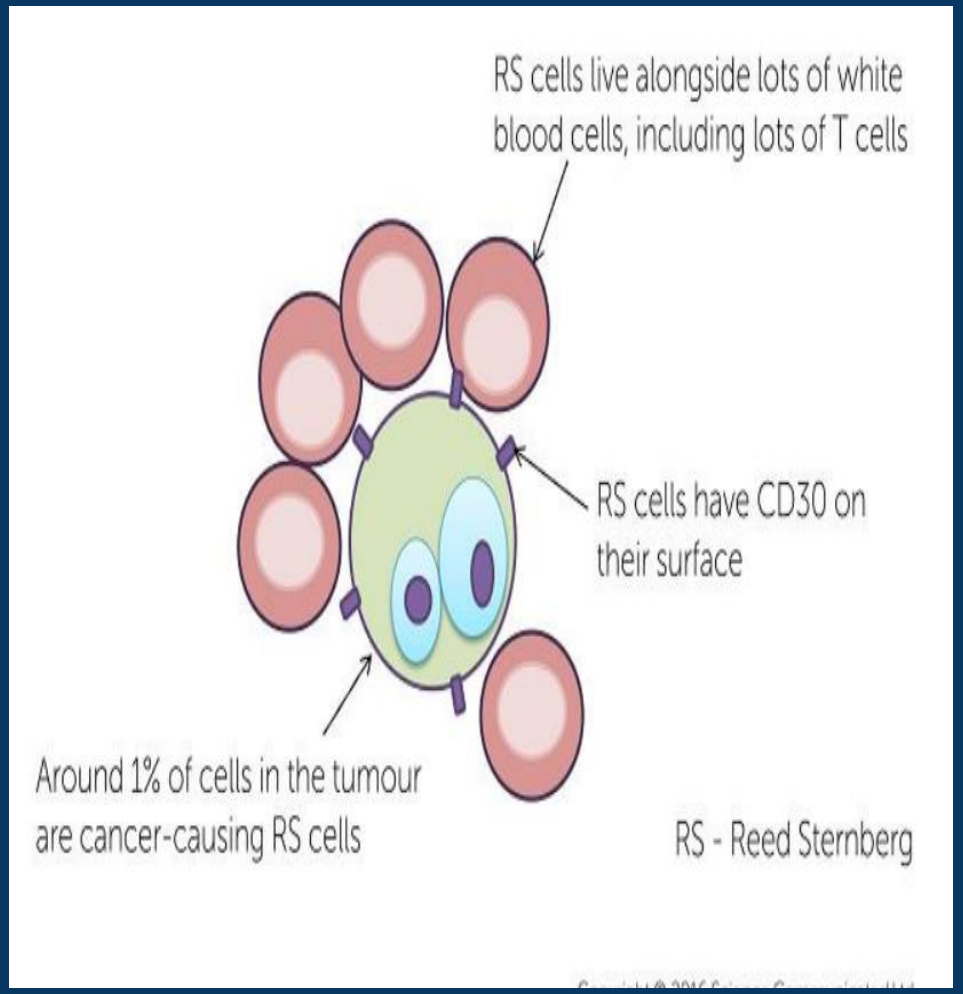
Targeted Treatments for Hodgkin lymphoma

- HL cells– are large, abnormal cells called Reed Sternberg (RS) from B cells.
- RS cells as cancer cells contain a range of DNA mutations, been activated by an infection, but that have gone wrong during the process of somatic hypermutation
- **RS cell lost normal features of B cells, such as CD20 and B cell receptors replaced with other proteins like CD30.**



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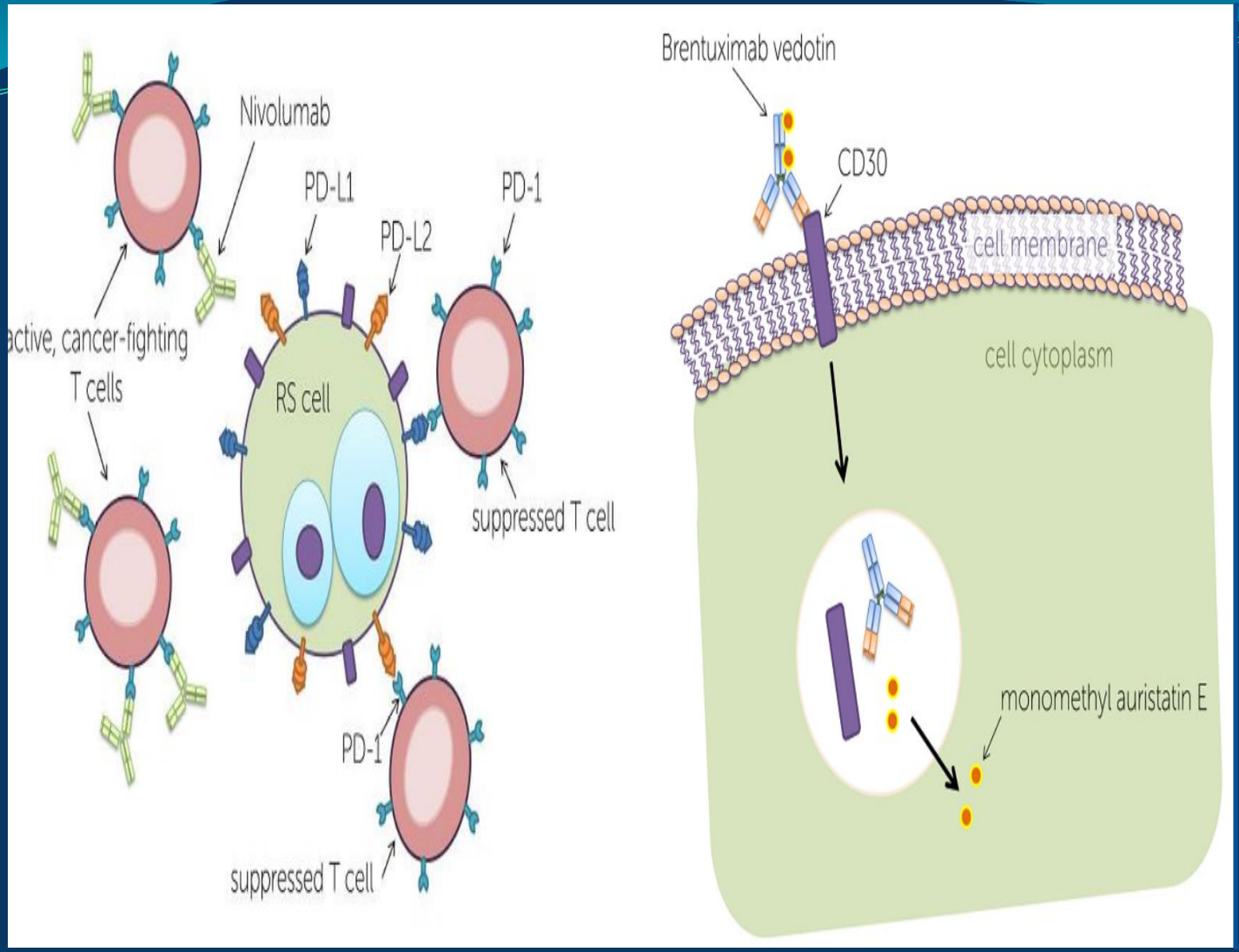
- Some HL (nodular lymphocyte predominant Hodgkin's lymphomas (NLPHL)) – that do have CD20 on their surface
- HL targeted medicine: brentuximab vedotin and nivolumab
- Rituximab rx non-Hodgkin lymphoma or chronic lymphocytic leukaemia, or to people with relapsed NLPHL
- Brentuximab vedotin (~ trastuzumab-emtansine) is a drug-conjugated anti-CD30 antibody - it's an antibody that targets CD30, which has been chemically fused to chemotherapy (aimed to delivers chemotherapy into RS cells



- Nivolumab is recent treatment to be approved for HL, because the DNA of RS cells often contains multiple copies of one part of xsome 9 amplification with PD-L1, PD-L2 genes code for surface PD-L1 and PD-L2 proteins to suppress T cells that try to destroy them
- Nivolumab attaches to PD-1 and prevents it from connecting with PD-L1 or PDL2.
- And, with PD-1 blocked, the T cells stay active and attack and destroy RS cells.

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Tumor Biology: Best Prognostic Indicators

- Cancer Biomarkers/CB fluctuation relate: tumor behavior, size, burden, progressive disease, decrease with remission, at basal level with stable CA
- CB level best indicator of tumor recurrence (3–12 months) before clinical or radiological evidence of cancer recurrence(above basal level), at basal level indicating successful therapy or remission or encountered resistance (alternative)

Oral Oncolytic Therapy
Oncology Pharmaceutical Personnel

Oral Oncolytic Therapy

- What Oncology Pharmaceutical Personnel should provide on oral Oncolytic Therapy?

  ∏ Prescribing ∏ Education ∏ dispensing ∏ distribution ∏ monitoring and follow-up.

- Oral Oncolytic: **oral cytotoxic agents** (capecitabine, MTX, busulfan, 6-MP, etoposide, chlorambucil)and **small-molecule inhibitors** (lapatinib, imatinib, dasatinib, sunitib, crizotinib) that target surface proteins, tumor pathways, and receptors.
- More convenient, ensure therapeutics alliance, IV->PO shift (some cases)
  - FOLFOX=> CapeOX
- Oncology Pharmaceutical Personnel: improve how these drugs are prescribed, dispensed, administered, and monitored
- Enhanced by the expertise in medication management, training in patient education and self-care management, and focus on the quality and safety of care, are extraordinary

23. Mackler E, Segal EM, Muluneh B, Jeffers K, Carmichael J. 2018 Hematology/Oncology Pharmacist Association Best Practices for the Management of Oral Oncolytic Therapy: Pharmacy Practice Standard. J Oncol Pract. 2019 Apr;15(4):e346-e355. doi: 10.1200/JOP.18.00581. Epub 2019 Mar 12. PMID: 30860937; PMCID: PMC6494244.

Oral Oncolytic Management Best Practices

- Oncology Pharmaceutical Personnel should provide a comprehensive review via an interprofessional formulary committee
- Oncology Pharmaceutical Personnel should support prescriber, nurses, social workers, patient- and medication-specific characteristics
- Oncology Pharmaceutical Personnel should be involved provide control and standard supportive care measures or monitoring
- Oncology Pharmaceutical Personnel should perform a comprehensive medication review at the time of prescription, safety and quality and be consistent with IV treatment standards
- Oncology Pharmaceutical Personnel should support oncology team on pertinent drug–drug interactions, patient's comorbidities and management strategies to the patient's PCP
- Oncology Pharmaceutical Personnel should be involved in the development or endorsement of standardized education materials focus on patient self-care management of oral oncolytic ADRs , medication adherence, patient knowledge, confidence to manage AE
- Oncology Pharmaceutical Personnel should provide financial support, access to necessary information for safely filling, including laboratory values (TDM-RFT, LFT and CBC) and progress notes

Oral Oncolytic Management Best Practices

- Oncology Pharmaceutical Personnel should have a dedicated liaison for the clinic and provide information that includes financial toxicities, refills, medication adherence, and any identified medication adverse effects
- Oncology Pharmaceutical Personnel should be involved in the creation of the assessment and monitoring of a patient's symptoms and medication adherence, 7 and 14 days after the start of treatment, at least before each refill
- Oncology Pharmaceutical Personnel should perform medication reconciliation, pharmacy only exist clinics; must be user friendly, reliable, cost effective, and practical
- Oncology Pharmaceutical Personnel should able to use and interpret: laboratory and symptom monitoring to communicate any alert for patients prognosis.
- Oncology Pharmaceutical Personnel should have profession development program , assess areas for improvement measures
- Oncology Pharmaceutical Personnel should be able to perform pre- and post financial, clinical quality measures, including interprofessional and patient experience

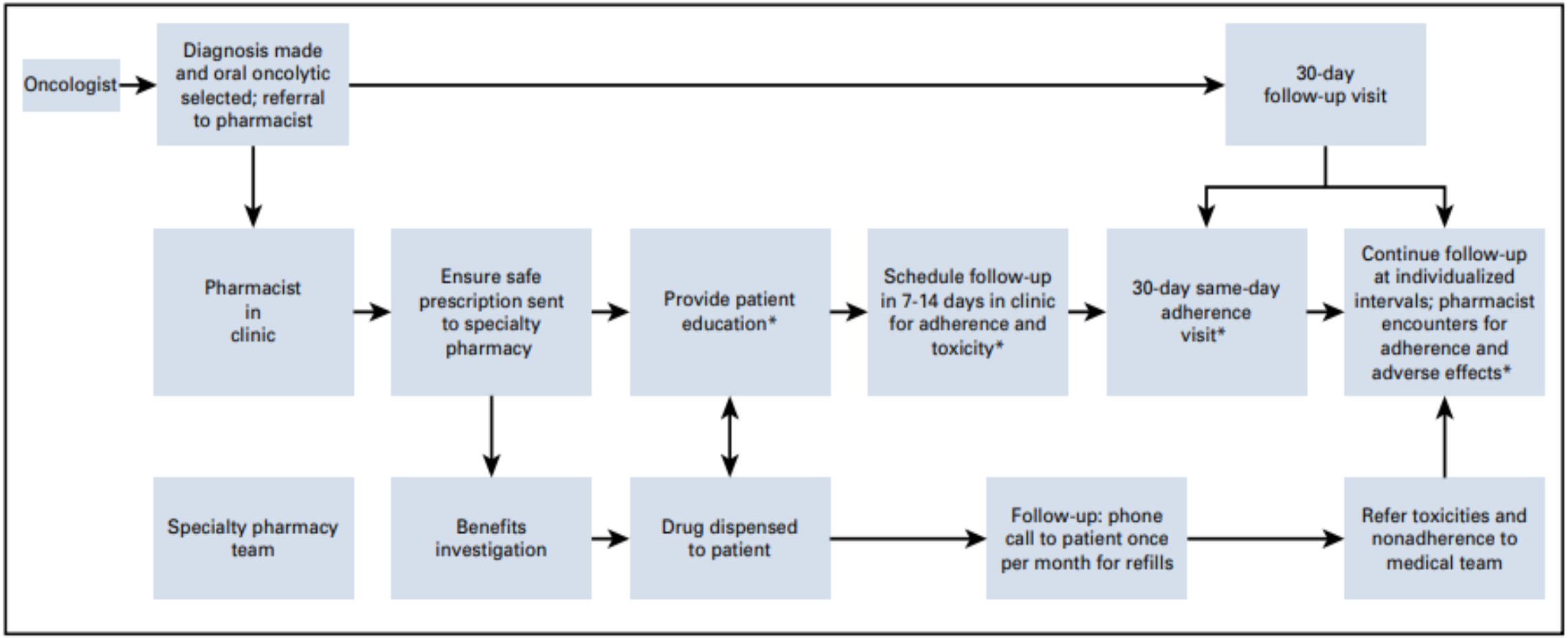


FIG 1. Oral Oncolytic Management - Example Workflow. (*) Encounters may be completed via telephone or an in-clinic encounter.

23. Mackler E, Segal EM, Muluneh B, Jeffers K, Carmichael J. 2018 Hematology/Oncology Pharmacist Association Best Practices for the Management of Oral Oncolytic Therapy: Pharmacy Practice Standard. J Oncol Pract. 2019 Apr;15(4):e346-e355. doi: 10.1200/JOP.18.00581. Epub 2019 Mar 12. PMID: 30860937; PMCID: PMC6494244.

Oral Oncolytic Management (OOM) Programs

- An OOM program may be based on one of several models.

1. Telepharmacy: patients treatment engagement via telephone.
2. Face-to-face: enhanced pharmacist–patient relationships and provider satisfaction
3. Hybrid model: in-person encounters for education (verification of safe prescribing) and continued monitoring visits(telephone)(adherence and self management of ADRs).

- **OOM program aimed:**
  - To measure clinical, economic, and satisfaction outcomes
  - To measure impacts of patient education, behavior changes, understanding, adherence, and patient satisfaction
  - To set oncology clinical pharmacist interventions

Oral Oncolytic Therapy

- Involved cancer care, the cost of therapy, tolerability, safety of medications, patient access, patient education, patient self-care management, and the monitoring and follow-up of this patient population.
- Oncology Pharmaceutical Personnel
- Well positioned to partner with physicians, nurses, and other clinicians in the management cancer patients
  - Ensuring safe prescribing patterns; conducting comprehensive medication reviews, given the propensity for drug–drug interactions; providing patient education; ensuring proper drug distribution and patient access; and monitoring adverse effects and medication adherence.

Anticancer ADR Therapeutics
Oncology Pharmaceutical Personnel

Anticancer ADR Therapeutics

- **Hematologic Toxicities: Effects of Chemotherapy on Bone Marrow:**
  1. **Myelosuppression**: Rx IV filgrastim (GCSF) and sargramostim (GMCSF)
  2. **Anemia and Erythropoietin**: Rx EPO(r-HUEPO), darbepoetin alpha and BT
  3. **Thrombocytopenia**: Rx platelets transfusion, Oprelvekin
  4. **Thrombotic Events**: **Rx Enoxaparin(LMWH)/monthly no need of PT, PTT, INR**
- **Gastrointestinal Tract Toxicities**
  1. **Nausea and Vomiting**: Rx Palonesentrone-5-HT3, Ondasentrone5-HT3, Aprepitant-neurokinin-1, Dexamethasone, dopamine antagonist-promethazine, benzodiazepines- lorazepam, butyrophenones-haloperidol, benzamides-metoclopramide and cannabinoid- nabilone
  2. **Mucositis (or stomatitis), xerostomia (dry mouth), infection, and bleeding**: Rx: topical anesthesia, BMX, antibiotics/nystatin/corticosteroids, Sucralfate, mucaine, systemic analgesics

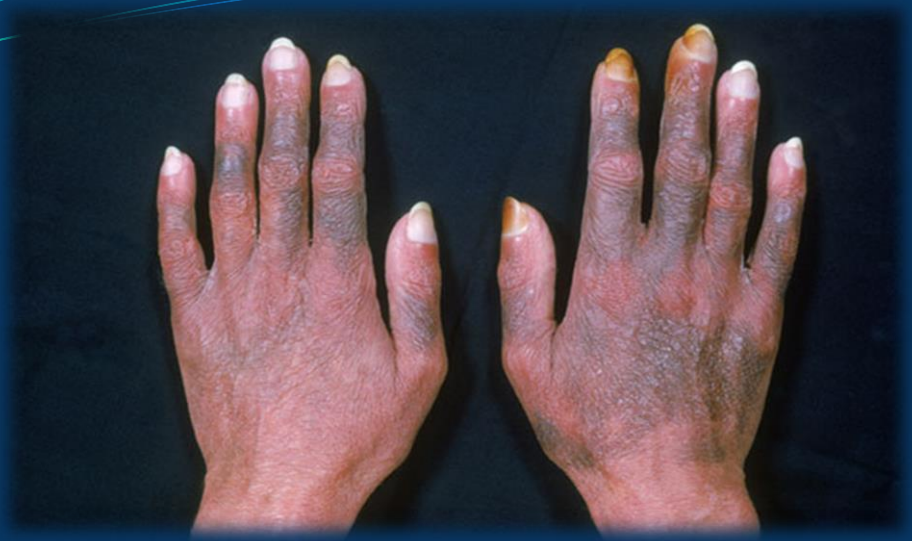
Anticancer ADR Therapeutics….I

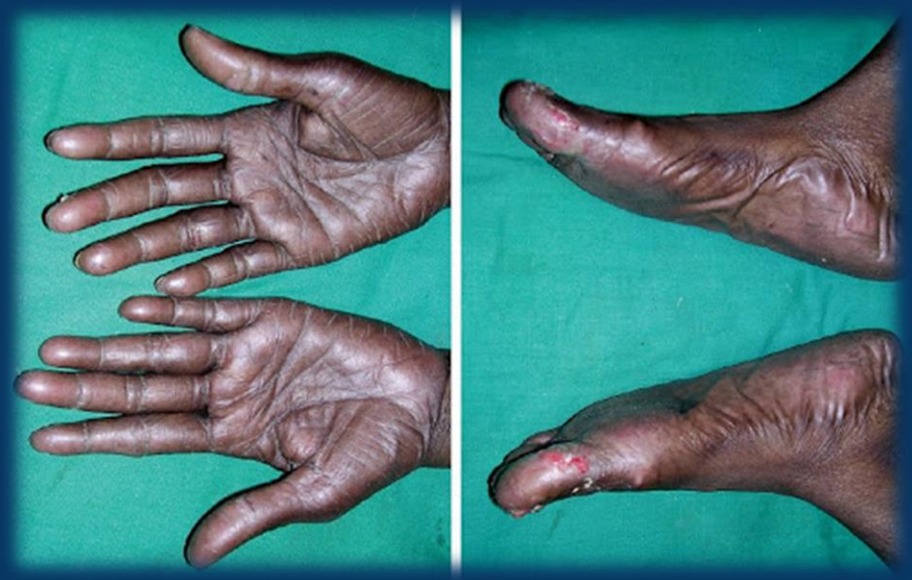
❑ Lower GI Tract Complications

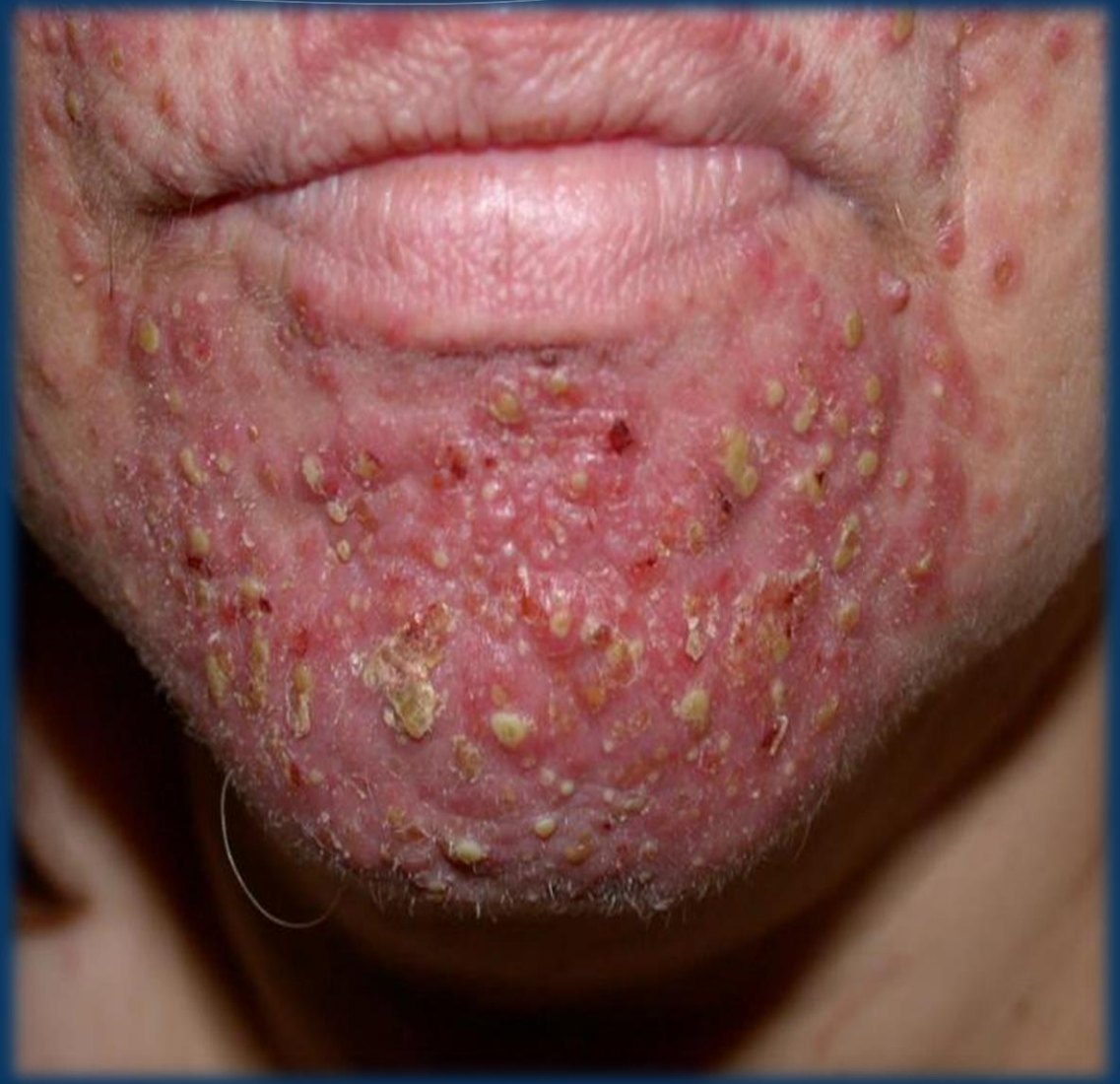
1. **Diarrhea**: Rx atropine IV/SC, loperamide, DNS/RL, Octreotide
2. **Constipation**: Rx bisacodyl tabs, lactulose, fiber foods
3. **Malabsorption**: Rx more related with DI with verapamil, phenytoin and digoxin

❑ Dermatologic Toxicities

1. **Alopecia**: counselling and predisposed after chemotherapy
2. **Nail Changes**: counselling and fade after chemotherapy
3. **Dermatologic Pigment Changes**: counselling and fade after chemotherapy
4. **Hand–Foot Syndrome/Palmar-Plantar Erythrodysesthesia; PPE**: use cream moistening, steroids, sun screen, antibiotics cream(TTCN + clindamycin)







Anticancer ADR Therapeutics….2

- **Acneiform–Erythematous Rash**: use cream moistening, steroids, sun screen, antibiotics cream(TTCN + clindamycin)
- **Dry Skin**: use cream moistening
- **Hypersensitivity reaction**: diphenhydramine, prednisolone, MEP, dexamethasone, and paracetamol, epinephrine, albuterol monitor drugs adm. Look sensitive excipients

- **Interactions With Radiation Therapy**: use sulfadiazine cream, sunscreen cream, antifungal, systemic antibiotics and antipain
- **Hypersensitivity Reactions/infusion related reaction**: Extravasation/Irritant and Vesicant Reactions: stop administration of chemotherapy, change cannulation site, ice press, paracetamol and irrigate with NS, elevate the limb

Anticancer ADR Therapeutics….3

- **Specific Organ Toxicities**
  1. **Neurotoxicity/neuropathy**: antipains, gabapentin, pregabalin and vitamin complexes supplements
  2. **Peripheral neuropathy** : antipains, gabapentin, pregabalin and vitamin complexes
  3. **Cranial Nerve Toxicity**: treat the symptoms like insomnia with TCA and psychosis with benzodiazepine, pain with opioids analgesics
  4. **Autonomic Neuropathy**: antipains, gabapentin, pregabalin and vitamin complexes
  5. **Cardiac Toxicities**: review cardiac profile and consider use of cardioprotective drugs or change the treatments
  6. **Nephrotoxicity**: use Prehydration & Posthydration with DNS, KCL, MgSO4, Ca-Gluconate, mesna
  7. **Pulmonary Toxicities**: regular assessment of lungs function
  8. **Hepatotoxicity**: asses LFT, asses drugs interaction with previous medics and anticancers
  9. **Cerebellar toxicity** is a significant problem in patients receiving **HiDAC** therapy: assessment and regular patients review and mitigate the symptom
  10. **Ocular Toxicity**: assessment and regular patients review and mitigate the symptoms

Anticancer ADR Therapeutics….4

- **Second Malignancies After Chemotherapy**
  - Acute Myeloid Leukemia (AML)
- **Fertility and Teratogenicity**
  1. Effects on Oogenesis
  2. Effects on Spermatogenesis
  3. Teratogenicity

Therapeutic Monitoring And Follow-Up
Oncology Pharmaceutical Personnel

Therapeutic Monitoring and Follow-Up

RFT	• Renal function tests: SrCr, BUN, proteinuria
PBM	• Prognostic Biomarkers: PSA, ER, PR, CEA (carcinoembryonic antigen)/CA(carbohydrate Antigen)-19-9
LFT	• Liver function test: AST, ALT,
CBC	• Complete blood count: Hb, Neutrophils, lymphocytes, platelets
E	• Electrolytes: Na, K, Ca, Mg
BCP	• Blood clotting profile: PT, PTT, aPTT, INR

World Health Organization (WHO) Performance Status Classification in Cancer

0	Able to carry out all normal activity without restriction
1	Restricted in physically strenuous activity but ambulatory and able to carry out light work
2	Ambulatory and capable of all self-care but unable to carry out work
3	Capable of only limited self-care; confined to bed or chair 50% or more of waking hours
4	Completely disabled; not capable of any self-care; confined to bed or chair

Assessing Response to Therapy

1. **Complete Response (CR):** Disappearance of all target lesions
2. **Partial Response (PR):** 30% decrease in the sum of the longest diameter (LD) of target lesions, taking as reference the baseline sum LD
3. **Progressive Disease (PD):** At least a 20% increase in the sum of the LD of target lesions, taking as reference the smallest sum LD recorded since the treatment started or the appearance of one or more new lesions
4. **Stable Disease (SD):** Neither sufficient shrinkage to qualify for PR nor sufficient increase to qualify for PD, taking as reference the smallest sum LD since the treatment started
5. **Disease-Free Survival:** Time from documentation of complete response until disease relapse or death.
6. **Overall Survival:** Time from treatment until time of death.

Closing Gape In Cancer Care

Oncology Pharmaceutical Personnel

Oncology Pharmaceutical Personnel Role Cancer Services

- Most of the healthcare providers (74%) perceived the increasing interest in clinical pharmacy services(30).
- Also, they expected
  - providing consultations regarding appropriate medication choices (82%);
  - providing information about medication availability and shortages (82%);
  - assisting in the prescribing of cost effective drugs by providing pharmacogenomics information routinely (75%) and
  - Participating actively in research activities (74%).
  - Overall, healthcare providers have a high level of trust in the clinical pharmacists' abilities ($P < 0.01$)

30. Omar NE, Elazzazy S, Abdallah O, Nashwan AJ, Eltorki Y, Afifi HM, Kassem N, Yassin M, Hamad A. Perceptions and expectations of health care providers towards clinical pharmacy services at a tertiary cancer centre in Qatar. J Oncol Pharm Pract. 2020 Jul;26(5):1086-1096. doi: 10.1177/1078155219882076. Epub 2019 Nov 13. PMID: 31718469; PMCID: PMC7338705.

Table 4 Cost-benefit analysis of pharmacist interventions in different expenditure types

	2011	2012	2013	2014	2015	2016
Prescription at self payment						
Number of inappropriate prescription	905	720	450	204	116	114
Cost of inappropriate prescription(Dollar)[a]	20,532	17,053	14,103	6730	3844	4212
Cost of pharmacist time(Dollar)[b]	2601	2971	3341	3481	3596	3540
Benefit-to-cost ratio [c]	7.89	5.74	4.22	1.93	1.07	1.19
Prescription at public payment						
Number of inappropriate prescription	229	171	107	44	28	27
Cost of inappropriate prescription(Dollar)[a]	6624	5701	4231	2086	1001	954
Cost of pharmacist time(Dollar)[b]	510	540	589	530	572	585
Benefit-to-cost ratio [c]	13.00	10.56	7.18	3.94	1.75	1.63
Prescription at insurance payment						
Number of inappropriate prescription	711	571	359	190	102	97
Cost of inappropriate prescription(Dollar)[a]	16,344	13,964	11,293	6538	3878	3812
Cost of pharmacist time(Dollar)[b]	1873	2155	2422	2976	3505	3743
Benefit-to-cost ratio [c]	8.73	6.48	4.66	2.20	1.11	1.02

[a]Cost of inappropriate prescription in each expenditure type = the sum of costs of inappropriate items of this type;
[b]We supposed that each prescription took the pharmacist the same time. The time each prescription consumed = (Total pharmacist time)/ (Number of reviewed prescriptions)(see Table 4 and Table 1); Pharmacist time spend on each expenditure type = (The time each prescription consumed)* (Prescription number of this type)(see Table 1); Cost of pharmacist time = (Pharmacist time spend on each expenditure type)* (Hourly salary)(see Table 4);
[c]Benefit-to-cost ratio = (Cost of inappropriate prescription in each expenditure type)/(Total cost of pharmacist time);

30. Bao Z, Ji C, Hu J, Luo C, Fang W. Clinical and economic impact of pharmacist interventions on sampled outpatient prescriptions in a Chinese teaching hospital. BMC Health Serv Res. 2018 Jul 4;18(1):519. doi: 10.1186/s12913-018-3306-4. PMID: 29973200; PMCID: PMC6031100.

Oncology Pharmaceutical Personnel in TB

- Optimize the process of care by improving the quality of the medication use process and disease management through effective interactions with both patients and other health professionals. (31, 32).
- Encouraging more Oncology Pharmaceutical Personnel to specialized in clinical pharmacy and get super specialized in oncology, (2yrs of MPHCP, 1yr MSC onco.)
- Recommended to all medical practitioner to collaborate with pharmacists who show interest in oncology best practice
- Establishing Oncology Pharmaceutical Personnel tumor boards and participating in MDT/TB
- Become a member of TOS, NCCN, SIOP, ISOPP, SITC etc. to learn and network

31. Carter BL, Rogers M, Daly J, Zheng S, James PA. The potency of team-based care interventions for hypertension: a meta-analysis. Arch Intern Med. 2009; 169(19):1748–55. https://doi.org/10.1001/archinternmed.2009.316. PMID: 19858431.

32. Kaboli PJ, Hoth AB, McClimon BJ, Schnipper JL. Clinical pharmacists and inpatient medical care: a systematic review. Arch Intern Med. 2006;166(9): 955–64. https://doi.org/10.1001/archinte.166.9.955. 16682568


International Oncology Specialties Memberships
1. International Society of Paediatric Oncology-Africa (SIOP)
2.International Society of Paediatric Oncology-Global (SIOP)
3. Internation Society of Oncology Pharmacy Prectitioners (ISOPP)
4. Society for Immunotherapy of Cancer (SITC)
5. National comprehensive cancer network (NCCN)
6. Africa Palliative Care Association-APCA
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Chief Pharmacist BMH (HoD-Pharmacy)
Haemato-Onco-Clinical Pharmacist
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"An expert is a person who has made
all the mistakes that can be made in a very narrow field"