Title:
Personalizing Treatment in Precision Oncology

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Objective of your solution: (Briefly define the primary outcome of your solution to this challenge):
In precision oncology, personalizing treatment is adjusting cancer treatments according to each patient's unique genetic, environmental, and lifestyle characteristics in order to maximize therapeutic benefit and reduce side effects. This strategy seeks to address the distinct features of each patient's cancer, departing from the conventional "one-size-fits-all" methodology.

Describe your solution / proposal: Provide a detailed account of your solution/ proposal to this challenge. You could type your solution/ proposal here. (Disclaimer: Solution/proposal should not exceed more than 300 words.):
A)
1. Targeted therapy is the application of a special medication designed for the treatment of a specific patient that is identified through genomic profiling which compares the gene sequences of cancer cells and normal cells to locate mutations (for example, EGFR, HER2, and BRAF).
2. Immunotherapy is Predictive of patient's immune system reaction to checkpoint inhibitors (PD-L1, TMB, MSI status, etc.) in the z treatment of cancer.
3. AI-assisted surgery software for surgeons has come a long way; today, it can identify the tumor margins and assist in the robotically controlled removal of the tumors with the highest precision and effectiveness.
4. The idea of obtaining circulating tumor DNA (ctDNA) (usually via a liquid biopsy approach) from a patient, then making an accurate early diagnosis, and predicting potential recurrence, is now possible due to the introduction of biochemical and biomarker analyses in medicine.
5. AI Prognostic Models: In such models, a machine-learning algorithm determines the survival time and the patient's response to different treatments.
6. Neoadjuvant and Adjuvant Therapy Optimization: Genetic profiling for cancer cells can help decide on the most effective therapy e.g. radiation or chemotherapy.
7. Most patients with serious illnesses develop secondary conditions like anxiety or depression, and these can be reduced by palliative care based on personalized and genetic assessments of the patients and their needs.

B) Barriers to Precision Oncology's Adoption in Clinical Practice
1. High Cost & Limited Insurance Coverage-Health care systems may not entirely reimburse expensive genetic testing, targeted therapies, and customized treatments.
2. Limited Access to Advanced Testing-Suboptimal infrastructure for genome sequencing, notably in places with limited funds.
3. Complex Data Interpretation-The oncologist may have problems using and analyze a wide range of more and genomic data.
4. Adoption may be hampered by variations in clinical procedures and changing data due to the lack of standardized guidelines.
5. Regulatory & Ethical Challenges-Strict approval procedures are making it hard for providers to get the tests faster and there are also concerns about genetic privacy."

6. Strict eligibility requirements prevent many patients from being enrolled in precision oncology trials, which result in limited clinical trial enrollment.
7. Healthcare Provider Education and Awareness: It is necessary to provide specialized training in molecular oncology and AI-powered decision-making.
8. Variability in Tumor Heterogeneity: As cancers alter over time, their constituents' original molecular profiles are less valid.
9. The challenge of integrating genetic data with clinical procedures for smooth decision-making is known as integration with electronic health records, or EHRs.
10. Patient Awareness & Acceptance: Patients' therapeutic results may be diluted by lack of knowledge as well as trust.

C)
1. Reduce Spending and Enhance Insurance Coverage
2. Make Genomic Tests More Accessible
3. Easy Data Interpretation
4. Clinical Guideline Standardization
5. Simplify Regulatory Processes
6. Make Clinical Trials More Accessible
7. Enhance Provider Training
8. Tackle Tumor Heterogeneity
9. Improve EHR Integration Quality
10. Strengthen Patients' Awareness and Engagement
11. Through the implementation of these remedies, it can be expected that the adoption of precision oncology will be improved resulting in increased patient outcomes and more widespread reach in the healthcare system.

D)
A) Case Selection & Referral Pre-Meeting Preparation
1. The cases that require the molecularly guided treatment choices are submitted by the oncologists.
2. Patients undergo biomarker testing and genomic sequencing, Data Collection & Integration Compile imaging, pathology reports, clinical history, and genomic data
3. AI-powered help for decision making for molecular genetic information studies may arrange weekly or biweekly meetings according to a predetermined agenda that the meeting organizer decides on, which includes oncologists, pathologists, geneticists, radiologists, and bioinformaticians.

B) Case Presentation at the Molecular Tumor Board Meeting
1. The doctors give a brief medical history, diagnosis, and the current step in the therapy of the patient.
2. Molecular and Genomic Analysis, Talk about clinical trial choices, targeted medicines, and biomarker data.
3. The information is disguised and is decoded by pathologists, bioinformaticians, and geneticists.
4. Consider other treatment options such as immunotherapy, targeted therapy, combination methods, etc.
5. The EHR records the endpoint of the treatment decision consensus. AI is part of the team that creates custom plans of action for patients.

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Objective of your solution: (Briefly define the primary outcome of your solution to this challenge):
Primary Outcomes
1. Improved Patient Outcomes: Enhanced treatment efficacy, improved survival rates, and better quality of life for cancer patients.
2. Increased Patient Satisfaction: Higher patient satisfaction with personalized care, improved communication, and better coordination among healthcare providers.
3. Enhanced Healthcare Provider Collaboration: Improved collaboration and communication among healthcare providers, including medical oncologists, surgeons, radiation oncologists, and pathologists.
4. Optimized Care Coordination: Streamlined care coordination processes, reducing delays and improving timely access to necessary services.
5. Better Utilization of Genomic Data: Effective use of genomic data to inform treatment decisions, improving treatment efficacy and reducing unnecessary treatments.
Quantifiable Metrics
1. 30% increase in patient satisfaction with care
2. 25% improvement in treatment efficacy
3. 20% reduction in treatment-related adverse events
4. 15% increase in healthcare provider satisfaction with care coordination
5. 10% reduction in healthcare costs

Describe your solution / proposal: Provide a detailed account of your solution/ proposal to this challenge. You could type your solution/ proposal here. (Disclaimer: Solution/proposal should not exceed more than 300 words.):
Areas in Oncology for Precision Approach
1. Genomic analysis: Identifying specific genetic mutations or alterations to guide targeted therapies.
2. Immunotherapy: Tailoring immunotherapies based on individual tumor characteristics and immune system profiles.

3. Liquid biopsies: Analyzing circulating tumor DNA or other biomarkers to monitor treatment response and detect resistance.
4. Radiogenomics: Using genetic information to predict radiation therapy response and optimize treatment planning.
5. Cancer predisposition syndromes: Identifying genetic mutations that increase cancer risk and developing personalized prevention and surveillance strategies.

Barriers to Uptake of Precision Oncology

1. Limited access to genomic testing: High costs, limited availability, and variable insurance coverage hinder access to genomic testing.
2. Complexity of genomic data interpretation: Healthcare providers may lack the necessary expertise to interpret genomic data and make informed treatment decisions.
3. Limited standardization and regulation: Variability in testing platforms, data analysis, and reporting can lead to inconsistent results and challenges in comparing data across institutions.
4. High costs of targeted therapies: Expensive targeted therapies can be a significant financial burden for patients and healthcare systems.
5. Need for multidisciplinary collaboration: Precision oncology requires collaboration among healthcare providers, geneticists, pathologists, and other specialists, which can be challenging to coordinate.

Practical Solutions for Addressing Barriers

1. Developing standardized genomic testing protocols: Establishing standardized testing protocols and data analysis pipelines can improve consistency and comparability of results.
2. Providing education and training for healthcare providers: Offering education and training programs can help healthcare providers develop the necessary expertise to interpret genomic data and make informed treatment decisions.
3. Implementing cost-effective strategies for genomic testing: Developing cost-effective strategies, such as targeted panel testing, can make genomic testing more accessible and affordable.
4. Fostering multidisciplinary collaboration: Establishing regular tumor board meetings and encouraging collaboration among healthcare providers can facilitate the integration of precision oncology into clinical practice.
5. Developing patient-centered care coordination models: Implementing patient-centered care coordination models can help ensure that patients receive comprehensive and coordinated care throughout their cancer journey.

Processes and workflows for molecular tumor board (MTB) meetings and patient care coordination:

Molecular Tumor Board (MTB) Meeting Process

1. Pre-Meeting Preparation:
- Gather relevant patient data, including medical history, pathology reports, imaging studies, genomic testing results (e.g., next-generation sequencing).
- Review patient data and identify potential treatment options

2. MTB Meeting:
- Assemble a multidisciplinary team, including medical oncologists, surgeons, radiation oncologists, pathologists, geneticists.
- Present patient cases and discuss genomic testing results, treatment options, potential clinical trials
- Reach a consensus on treatment recommendations

3. Post-Meeting Follow-up:
- Document treatment recommendations and rationale
- Communicate treatment plans to patients and their families
- Ensure timely implementation of treatment plans.

Patient Care Coordination Workflow

1. Patient Intake and Assessment:
- Gather patient information, including medical history and treatment goals
- Assess patient needs and identify potential barriers to care

2. Care Plan Development:

- Develop a personalized care plan, including treatment recommendations, follow-up appointments
- Supportive care services (e.g., pain management, nutrition counseling)
- Communicate care plan to patients and their families

3. Care Coordination and Navigation:
- Coordinate care among healthcare providers and services
- Navigate patients through the healthcare system, ensuring timely access to necessary services
- Address patient concerns and barriers to care

4. Ongoing Monitoring and Evaluation:
- Regularly monitor patient progress and adjust care plans as needed
- Evaluate patient outcomes and satisfaction with care

Key Performance Indicators (KPIs) for MTB Meetings and Patient Care Coordination

1. MTB Meeting KPIs:
- Percentage of patients discussed at MTB meetings
- Time from MTB meeting to treatment initiation
- Patient satisfaction with MTB meeting process

2. Patient Care Coordination KPIs:
- Percentage of patients with a personalized care plan
- Time from care plan development to treatment initiation
- Patient satisfaction with care coordination and navigation

Technology and Tools to Support MTB Meetings and Patient Care Coordination

1. Electronic Health Records (EHRs): Utilize EHRs to document patient information, treatment plans, and communication among healthcare providers.
2. Tumor Board Software: Leverage software specifically designed for tumor board meetings, such as OncologyAnalytics or TumorBoard.
3. Care Coordination Platforms: Implement care coordination platforms, such as Care Coordination Platform (CCP) or Patient Engagement Platform (PEP), to facilitate communication and navigation among healthcare providers and patients.
4. Genomic Analysis Tools: Utilize genomic analysis tools, such as Foundation Medicine or Caris Life Sciences, to analyze genomic data and inform treatment decisions.

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Objective of your solution:(Briefly define the primary outcome of your solution to this challenge):
Primary Outcome of Precision Oncology Solutions:

1. Optimized Treatment Efficacy: Improved survival and response rates by matching therapies to tumor-specific genetic alterations (e.g., EGFR inhibitors for EGFR-mutant lung cancer).
2. Minimized Harm: Reduced unnecessary treatments/toxicity by avoiding therapies unlikely to benefit the patient (e.g., omitting chemotherapy in low-risk MSI-H colorectal cancer).
3. Streamlined Patient Care: Faster, coordinated decision-making via molecular tumor boards and integrated EHR workflows, reducing delays in therapy initiation.
4. Equitable Access: Broader availability of genomic testing and targeted therapies across diverse populations through cost-reduction strategies and training programs.

Describe your solution / proposal: Provide a detailed account of your solution/ proposal to this challenge. You could type your solution/ proposal here. (Disclaimer: Solution/proposal should not exceed more than 300 words.):

Areas for Precision Oncology Application

1. Targeted Therapies: Match mutations (e.g., *EGFR*, *ALK*) with tyrosine kinase inhibitors in lung cancer.
2. Immunotherapy: PD-L1/MSI-H testing to guide checkpoint inhibitor use (e.g., pembrolizumab).
3. Hereditary Cancer Syndromes: *BRCA* testing for *PARP* inhibitors in ovarian/breast cancer.
4. Liquid Biopsies: Detect resistance mutations (e.g., *EGFR* T790M) to adjust therapy.
5. Minimal Residual Disease (MRD) Monitoring: ctDNA analysis post-surgery to guide adjuvant therapy.

Barriers to Uptake

1. Cost: High expenses of genomic testing/targeted drugs, particularly in low-resource settings.
2. Access: Limited availability of NGS (next-generation sequencing) platforms or bioinformatics expertise.
3. Knowledge Gaps: Clinician unfamiliarity with interpreting genomic data.
4. Regulatory Delays: Slow approval of novel biomarkers/tests.
5. Data Fragmentation: Fragmented genomic/clinical data across institutions.
6. Ethical Concerns: Patient anxiety about incidental findings/genetic discrimination.

Practical Solutions

1. Cost Reduction:
a) Subsidize testing via public-private partnerships.
b) Advocate for insurance coverage of NGS panels.
2. Capacity Building:
a) Train oncologists/pathologists via certifications (e.g. Molecular Oncology Course).
3. Standardization:
a) Adopt guidelines (e.g. ESMO Scale for Clinical Actionability of Molecular Targets).
b) Create shared genomic databases (e.g., AACR Project GENIE).
4. Patient Engagement:
a) Use genetic counsellors to address ethical concerns.
b) Develop multilingual apps for consent/education.

Molecular Tumor Board (MTB) & Care Coordination

Workflow:
1. Preparation:
a) Circulate patient data (genomic, imaging, pathology) 72h pre-meeting.
2. Meeting Structure:
a) Attendees: Medical oncologist, pathologist, geneticist, bioinformatician, ethicist.
b) Case review (10 mins): Present actionable targets, clinical trials, and caveats.
3. Decision Documentation:
a) Record recommendations in EHR with priority tiers (e.g., Tier 1: FDA-approved).
b) Assign follow-up tasks (e.g., pharmacist to source off-label drugs).

Care Coordination:
1. Patient Navigation:
a) Nurse navigators explain MTB outcomes and coordinate next steps (e.g., trial enrolment).
2. Tech Integration:
a) EHR alerts for biomarker-driven trial eligibility.
3. Quality Assurance:
a) Audit MTB decisions against outcomes (e.g., response rates).
b) Feedback loops to refine protocols (e.g., rejecting low evidence targets).

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Objective of your solution: (Briefly define the primary outcome of your solution to this challenge):
Precision oncology application to reduce toxicity, increase specificity of the cancer treatment.

Describe your solution / proposal: Provide a detailed account of your solution/ proposal to this challenge. You could type your solution/ proposal here. (Disclaimer: Solution/proposal should not exceed more than 300 words.):
1. Precision oncology personalizes cancer treatment by tailoring therapies based on each patient's genetic, environmental, and lifestyle factors. This approach can be applied across various oncology domains including targeted therapy, immunotherapy, pharmacogenomics, liquid biopsies, hereditary cancer risk assessment, and radiogenomics. It enables more effective treatment and minimizes adverse effects. However, the adoption of precision oncology in clinical practice faces several barriers. These include limited access to advanced genomic testing, high costs with inconsistent insurance coverage, difficulty in interpreting complex genomic data, lack of standardized guidelines, workforce shortages, and low patient awareness. To overcome these challenges, practical solutions include expanding genomic testing infrastructure, implementing AI-powered decision-support tools, advocating for better reimbursement policies, enhancing clinician training, developing updated clinical guidelines, and improving patient education. These strategies collectively support wider integration of precision medicine into standard cancer care.
An effective framework for implementing precision oncology involves
1. Molecular Tumor Boards (MTBs), which guide complex treatment decisions.
2. The workflow includes identifying appropriate patients, gathering genomic and clinical data, reviewing cases in multidisciplinary MTB meetings, and documenting treatment recommendations.
3. Patient communication and shared decision-making are central, followed by treatment implementation and ongoing monitoring.
4. Coordination involves oncologists, pathologists, bioinformaticians, genetic counselors, pharmacists, and nursing staff to ensure comprehensive and personalized care.
This structured, team-based approach provides a practical blueprint for integrating precision oncology into routine cancer management, ultimately improving outcomes and quality of life for patients.

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Objective of your solution: (Briefly define the primary outcome of your solution to this challenge):
Implementing precision oncology requires a multidisciplinary, systems-based approach. Overcoming access, interpretation, and integration barriers is key to expanding its benefits. A well-structured molecular tumor board and coordinated workflow ensures that each patient's care is truly personalized.

Describe your solution / proposal: Provide a detailed account of your solution/ proposal to this challenge. You could type your solution/ proposal here. (Disclaimer: Solution/proposal should not exceed more than 300 words.):

Precision oncology is transforming cancer care by tailoring treatment based on a patient's unique genetic makeup, environment, and lifestyle. Rather than using a "one-size-fits-all" approach, it targets therapies to the specific biology of each individual's cancer. This approach has shown great promise in several areas—like identifying targeted therapies for lung, breast, and colon cancers based on genetic mutations, using biomarkers to guide immunotherapy, and monitoring minimal residual disease with liquid biopsies. It also helps match patients to clinical trials they're most likely to benefit from. However, the adoption of precision oncology in routine practice faces some real challenges. Many healthcare centers don't have easy access to comprehensive genetic testing, and even when testing is done, interpreting the complex results isn't always straightforward. There's also a shortage of trained specialists like molecular pathologists and genetic counselors. Plus, integrating genetic data into electronic health records is still a work in progress. Not all findings are immediately "actionable," which can leave doctors unsure of how to proceed. To address these barriers, we need practical solutions: wider access to affordable genomic testing, use of AI tools to assist in data interpretation, ongoing training for clinicians, and better data systems that integrate genetic findings with patient records. Clear guidelines and supportive reimbursement policies would also help. A key strategy is setting up Molecular Tumor Boards—regular meetings where oncologists, pathologists, geneticists, and other specialists review each patient's case together. They analyze genetic results, recommend targeted therapies, and coordinate care across disciplines. This team-based approach ensures personalized decisions are made thoughtfully and efficiently. By refining these systems and supporting clinicians with the right tools and training, we can make precision oncology more accessible—and more impactful—for every cancer patient.

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Objective of your solution: (Briefly define the primary outcome of your solution to this challenge):
To tailor cancer treatment to individual characteristics of each patient's tumor with goal of maximizing treatment efficacy and minimizing toxicity.

Describe your solution / proposal: Provide a detailed account of your solution/ proposal to this challenge. You could type your solution/ proposal here. (Disclaimer: Solution/proposal should not exceed more than 300 words.):

Working in a tertiary cancer care center with high volume of patients I have witnessed the transformative potential of precision oncology. However, the path from molecular diagnosis to patient impact is obstructed by socio economic, logistics and infrastructural challenges.

a. To overcome these challenges we need to recognize the areas where precision oncology has significant impact on patients' outcomes:

1. Lung cancer: *EGFR, ALK, ROS, RET, MET* testing the now standard
2. Breast cancer: HER2, *BRCA*, *PIK3CA* mutation guided therapy
3. Colo-rectal cancer: *RAS, BRAF* testing for targeted therapy
4. Sarcoma and rare cancers: for *NTRK* mutations

b. Barriers in clinical practice:

1. Cost and accessibility: the test and the targeted treatment for the same have exorbitant prices are out of reach for the common man especially in LMIC like India
2. Turnaround time: the usual time for reporting NGS report is 3 weeks, which is long especially when dealing with aggressive tumors like sarcoma.
3. Infrastructure: not many centers have the necessary infrastructure for testing the molecular profile of tumors
c. Solutions:
1. Using a lower dose when possible: It is seen that the dosages for the targeted agents are arbitrarily determined in the initial dose finding studies. At our Center we have clinical trials which have demonstrated that lower dose of the targeted agent has equal efficacy when compared to the full dose and this information should be made use of for delivering the agent to all the patients in a cost-effective way.
2. Improving turnaround time: By running more samples in a batch, the turnaround time can be effectively improved and to ensure the correct treatment is given to the patient quickly without any delay
3. Lowering the cost of MGS
4. Clinician and patient awareness: To improve clinician awareness regarding the availability and the developments in targeted agents to close the knowledge gap and effective patient treatment
5. Regular molecular tumor board meetings: To hold regular meetings with the molecular pathologists and the clinicians for delivering accurate treatment for the patient.
6. To encourage cross institution collaboration.

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Objective of your solution: (Briefly define the primary outcome of your solution to this challenge):
To sculpt a future in oncology where no patient is lost in the shadows of statistical averages; where their cancer is not just staged and graded, but deeply understood through the lens of their unique molecular story. Our mission: to weave together science, empathy, and innovation into a precision tapestry—where treatment is not merely administered, but orchestrated—in tune with the patient's genome, life, and voice.

Describe your solution / proposal: Provide a detailed account of your solution/ proposal to this challenge. You could type your solution/ proposal here. (Disclaimer: Solution/proposal should not exceed more than 300 words.):
Precision oncology is not just a scientific evolution—it's a human revolution. It dares to ask: What if every tumor held a secret, and we finally learned how to listen? To bring this vision to life, we must first democratize access. Molecular testing must leave the ivory towers and reach community clinics. Mobile genomics labs, cloud-linked diagnostics, and public-private partnerships can dissolve geographic and financial barriers. Next, we must reshape education. Not with dry manuals, but with immersive, case-based storytelling. Clinicians need to think in mutations, not just metastases. Data must flow—not trickle in silos. Imagine interoperable systems where a patient's molecular fingerprint travels with them, understood at every care point. Then comes the heartbeat: the Molecular Tumor Board. Weekly, multidisciplinary, nimble. Where oncologists, geneticists, bioinformaticians, and ethicists converge. Every case is a puzzle, every patient, a narrative. Recommendations aren't merely decisions, they're precision dialogues. Navigators bridge science and soul—walking with patients

through genomic jargon, financial hurdles, and therapeutic crossroads. And finally, we measure meaningfully. Not just survival curves, but time-to-right-therapy, equity in access, molecular remission, patient agency. This isn't just oncology. It's poetry in motion—of biology, technology, and empathy. Precision is not about perfection. It's about attention—to detail, to differences, to the dignity of individual disease. So, we ask not can we personalize care—but how can we not?

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Objective of your solution: (Briefly define the primary outcome of your solution to this challenge):
Improved patient outcomes through wider adoption of precision oncology, achieved by overcoming cost and access barriers, establishing standardized workflows, and enhancing multidisciplinary collaboration.

Describe your solution / proposal: Provide a detailed account of your solution/ proposal to this challenge. You could type your solution/ proposal here. (Disclaimer: Solution/proposal should not exceed more than 300 words.):
1. Key Areas for Precision Oncology Application Targeted Therapies: EGFR, BRAF, HER2 inhibitors in lung, melanoma, and breast cancers. Immunotherapy: PD-L1/MSI-H testing for checkpoint inhibitor eligibility. Liquid Biopsies: Dynamic monitoring of resistance mutations (e.g., KRAS in colorectal cancer). Radiosensitivity Profiling: Genomic signatures to guide radiation dose personalization. Pharmacogenomics minimizes adverse drug reactions by predicting individual responses to chemotherapy. Integrating lifestyle factors like diet and exercise into personalized treatment plans further enhances outcomes.
2.Barriers to widespread adoption include high costs of genomic testing, limited access to specialized expertise in interpreting complex genomic data, lack of standardized guidelines for implementing precision medicine, and inadequate reimbursement models. Additionally, the data infrastructure needed to manage and analyze large volumes of genomic data remains underdeveloped in many settings.
3.Solutions involve developing cost-effective next generation sequencing panels and incorporating genomic testing into routine cancer care pathways. Investing in training programs for oncologists and genetic counselors to interpret genomic data is critical. Developing standardized treatment algorithms based on genomic profiles improves consistency and efficiency. Government funding and innovative reimbursement models are vital to offset costs and broaden accessibility. Clinical trial designs should incorporate genomic profiling to gather real-world evidence for personalized treatment strategies.
4. Molecular tumor board meetings should follow structured workflows. Case presentations should include comprehensive genomic data, imaging results, and clinical history. Discussions should focus on selecting the most effective and appropriate treatment based on the patient's unique molecular profile and clinical context. Detailed documentation, including treatment plans, rationale, and follow-up strategies, is crucial. A centralized electronic health record system integrating genomic data and patient information ensures seamless patient care coordination. Patient navigators can facilitate communication, education, and logistical support throughout the treatment journey.

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Objective of your solution: (Briefly define the primary outcome of your solution to this challenge):
Precision Oncology emphasizes targeted treatments, immunotherapy, cancer screening, analysis of the tumor microenvironment, and single-cell analysis. The field faces several challenges, such as high expenses, technological constraints, gaps in knowledge, operational difficulties, and regulatory and ethical issues. Potential solutions involve providing financial assistance for genomic testing, investing in sequencing technologies, enhancing education, creating integrated care models, and implementing data governance policies. A structured approach for molecular tumor board meetings consists of identifying cases, integrating data, facilitating discussions, documenting decisions, ensuring follow-up, and guiding patients. Despite the obstacles, viable solutions include advocating for insurance coverage, investing in accessible sequencing technologies, and establishing robust data governance policies.

Describe your solution / proposal: Provide a detailed account of your solution/ proposal to this challenge. You could type your solution/ proposal here. (Disclaimer: Solution/proposal should not exceed more than 300 words.):
Key Areas for Precision Oncology –
1. Targeted Therapies: Using molecular profiling to pinpoint actionable mutations for treatments such as tyrosine kinase inhibitors or monoclonal antibodies.
2. Immunotherapy: Utilizing biomarkers like PD-L1 expression to inform the use of immune checkpoint inhibitors.
3. Cancer Screening and Early Detection: Applying genetic risk profiling to identify populations at high risk.
4. Tumor Microenvironment Analysis: Examining the interactions between cancer cells and their environment to enhance treatment strategies.
5. Single-Cell Analysis: Exploring the diversity within tumors to improve therapeutic approaches.
Challenges in Adopting Precision Oncology –
1. Financial Constraints: The high costs associated with genomic testing and targeted therapies.
2. Technological Limitations: Limited access to cutting-edge sequencing technologies.
3. Knowledge Gaps: A lack of adequate training for clinicians in molecular diagnostics.
4. Operational Challenges: Disjointed care delivery and absence of standardized protocols.
5. Regulatory and Ethical Concerns: The need to balance data accessibility with patient privacy.
Practical Solutions –
1. Financial Solutions: Push for insurance coverage and financial support for genomic testing.
2. Technological Advancements: Invest in user-friendly sequencing technologies and AI-based analytics.
3. Education: Create thorough training programs for clinicians focused on precision oncology.
4. Integrated Care Models: Form multidisciplinary teams to enhance care delivery.
5. Ethical Frameworks: Establish strong data governance policies to protect patient privacy.
A framework for conducting molecular tumor board meetings: -
1. Composition: Include oncologists, pathologists, genetic counsellors.
2. Workflow: - Case Identification: Choose patients based on molecular profiling findings.
3. Data Integration: Gather genomic, clinical, and imaging data into a single platform.
4. Discussion: Evaluate actionable mutations and treatment options in an organized manner.
5. Decision Documentation: Record recommendations in electronic health records.
6. Follow-Up: Coordinate care across different specialties and track outcomes.
7. Patient Navigation: Utilize dedicated navigators to help patients understand and access recommended treatments.

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Objective of your solution: (Briefly define the primary outcome of your solution to this challenge):
Role of Preston oncology, barriers and methods to overcome them in Indian context.

Describe your solution / proposal: Provide a detailed account of your solution/ proposal to this challenge. You could type your solution/ proposal here. (Disclaimer: Solution/proposal should not exceed more than 300 words.):
Role of Precision Oncology
Precision oncology customizes cancer treatment based on a patient's tumor-specific genetic and molecular profile. By pinpointing actionable mutations, it enables targeted therapies or immunotherapies, improving survival, reducing adverse effects, and enhancing quality of life compared to conventional treatments. This approach optimizes efficacy, curbs resistance, and aids early detection and relapse monitoring. Cost-Effectiveness Challenges in India Precision oncology's high costs create barriers in India. Next-generation sequencing (NGS) and diagnostic tests often exceed ₹80,000 per test, unaffordable for many given India's per capita income (~₹2,00,000). Targeted therapies, ranging from ₹8,00,000 to ₹80,00,000 annually, burden patients, with >50% of healthcare costs paid out-of-pocket due to limited insurance. Molecular profiling infrastructure, like advanced labs, is urban-centric, restricting rural access. Low clinician awareness and underutilized molecular tumor boards lead to inefficient test ordering. Regulatory hurdles and limited availability of affordable generics inflate expenses, worsening financial strain.
Overcoming Challenges
1. To improve cost-effectiveness, India can foster public-private partnerships to subsidize NGS and diagnostics, mirroring initiatives like DIAMOnDS. Scaling up generic and biosimilar production, leveraging India's pharmaceutical strengths, can slash drug costs.
2. Training oncologists in cost-efficient biomarker testing and establishing virtual molecular tumor boards can streamline resource allocation. Centralized, high-throughput testing labs can lower per-test expenses, while mobile diagnostic units extend reach to rural areas.
3. Policy reforms to include precision therapies in insurance schemes, such as Ayushman Bharat, and fast-track drug approvals can reduce costs. Additionally, collecting real-world evidence, as in the Genome India Project, can inform cost-effective protocols.
These steps can make precision oncology accessible and sustainable, aligning with India's healthcare realities.

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Objective of your solution: (Briefly define the primary outcome of your solution to this challenge):

The objective of personalizing treatment in precision oncology is to tailor cancer therapy to individual characteristics of each patient's tumor rather than using a one size fits all approach.

Describe your solution / proposal: Provide a detailed account of your solution/ proposal to this challenge. You could type your solution/ proposal here. (Disclaimer: Solution/proposal should not exceed more than 300 words.):

Precision oncology transforms cancer treatment by adapting the treatments to the genetic, biochemical, environmental, and lifestyle characteristics of individual patients. It moves away from the traditional one-size-fits-all paradigm. It increases the rate of successful treatment while lessening toxicity. Precision oncology has come a long way in the management of non-small cell lung cancer, breast cancer (management of HER2-targeted therapy), colorectal cancer, and melanoma with molecular characterization. Precision oncology is also used in early detection of cancer, prediction of risk in high-risk populations, and monitoring treatment resistance.

Barriers in Clinical Uptake:

Despite its potential, several challenges hinder widespread use. These include:

1. Limited access to advanced genetic testing, particularly in low-resource areas.
2. High costs of targeted therapies and lack of insurance coverage.
3. Insufficient infrastructure for data storage and bioinformatics.
4. Shortage of trained personnel for genomic interpretation.
5. Fragmented healthcare systems with poor coordination between specialists.

Practical Solutions:

1. Funding and policy: Public-private sector collaboration and government incentives can enhance the availability and affordability of genomic testing.
2. Capacity building: Oncologists' training programs, pathologists', and data scientists are vital.
3. Clinical guidelines: Established protocols for when and how molecular profiling can be used will simplify decision-making.
4. Reform of insurance: Policies must be modified to include genetic testing and targeted treatments.

Suggested Workflow for Molecular Tumor Boards (MTBs):

1. Case Identification: Oncologist identifies patients who could benefit from genomic profiling.
2. Molecular Profiling: Genetic sequencing of the tumor and/or germline DNA.
3. Data Interpretation: Bioinformatics analysis and report generation.
4.Multidisciplinary Review: MTB, comprising oncologists, geneticists, pathologists, and bioinformaticians, discusses findings and therapeutic options.
5.Treatment Planning: Tailored therapy suggestions according to actionable mutations.
6. Care Coordination: Frequent communication between teams for follow-up, monitoring side effects, and fine-tuning therapies.

Incorporating MTBs into oncology practice can make precision oncology an accessible, effective, and integral component of cancer treatment.

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Objective of your solution: (Briefly define the primary outcome of your solution to this challenge):

Precision oncology has the potential to revolutionize cancer care through individualized treatment strategies. To realize its full potential, multidisciplinary collaboration, infrastructure enhancement, education, and streamlined workflows like molecular tumor boards are essential. By overcoming

practical barriers and adopting structured workflows, healthcare systems can integrate precision oncology into standard clinical practice, leading to improved outcomes for cancer patients.

Describe your solution / proposal: Provide a detailed account of your solution/ proposal to this challenge. You could type your solution/ proposal here. (Disclaimer: Solution/proposal should not exceed more than 300 words.):

Areas in Oncology Where Precision Approach Can Be Applied

1. Oncology Subspecialty Precision Application:

Lung Cancer: *EGFR, ALK, ROS1, KRAS, MET*, and *RET* mutation-targeted therapies

Breast Cancer: Hormone receptor status, HER2 amplification, *PIK3CA* mutation, *BRCA1/2* testing

Colorectal Cancer: *RAS/RAF* mutation analysis, MSI testing, HER2 expression

Melanoma: *BRAF* V600E mutation testing

Prostate Cancer: *BRCA1/2* testing guiding PARP inhibitor use

Barriers in Uptake of Precision Oncology in Clinical Practice Barrier Details.

1. High Cost and Limited Access
2. Genomic testing and targeted drugs are expensive and not widely available
3. Lack of Infrastructure
4. Limited availability of high-quality labs, bioinformatics platforms, and data sharing
5. Limited Clinician Familiarity
6. Oncologists may not be trained in interpreting genomic reports or using tools
7. Delayed Turnaround Time, long waiting times for test results, which can delay treatment initiation
8. Insurance/Reimbursement Issues: Lack of coverage for genomic tests and targeted agents Low
9. Awareness Among Patients: Patients may not know the relevance of genetic testing Ethical and Legal Issues
10. Privacy, consent, and secondary data use concerns

Practical Solutions to Overcome These Barriers Barrier

1. Cost and access: Government and philanthropic funding for subsidized testing; Public-private partnerships Infrastructure gaps Investment in regional molecular labs; Cloud-based bioinformatics support
2. Knowledge gap: Regular CME programs and online certifications in precision oncology Delays in testing Fast-track pathways for high-priority cases; In-house sequencing facilities

Workflow for Molecular Tumor Board (MTB) and Patient Care Coordination

1. Medical Oncologist - Pathologist - Molecular Biologist/Bioinformatician - Genetic Counselor - Clinical Pharmacologist - Nurse Navigator - Radiologist (as needed)
2. Standard Operating Workflow

Step-Action- Case Identification

Patient with advanced, rare, or treatment-refractory cancer referred to MTB Genomic Testing, Tumor tissue/blood sent for NGS, IHC, FISH, or PCR Pre-MTB

Data Curation Bioinformatics team analyzes data, prepares a summary report MTB Meeting Case discussed; actionable mutations matched with clinical trials or targeted therapies