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Interprofessional Management of Toxicities Related to Cancer Precision Medicine

Kristine Deano Abueg

Objective: *To review the key emerging side effects of precision medicine and provide discussion supporting multidisciplinary, interprofessional management.*

Data Sources: *Journal articles indexed on the National Library of Medicine database.*

Conclusion: *Emerging side effects of the precision medicine era are distinct from those associated with traditional cytotoxic chemotherapy on a variety of dimensions. Management benefits from the expertise of an interprofessional team. Data supports the expansion of the interprofessional team to include other medical specialists to assure that patients experience maximum benefit from today's precision medicine treatments.*

Implications for Nursing Practice: *Oncology nurses must broaden their standard assessment to incorporate emerging side effects and collaborate effectively with an expanded interprofessional team.*

Key Words: *precision medicine, interprofessional management, targeted therapy.*

Kristine Deano Abueg, RN, MSN, OCN, CBCN: *Oncology Clinical Trials Research Nurse, Kaiser Permanente – Roseville, Roseville, CA.*

Address correspondence to Kristine Deano Abueg, RN, MSN, OCN, Oncology Clinical Trials Research Nurse, Kaiser Permanente – Roseville, 1600 Eureka Road, Roseville, CA 95661. e-mail: Kristine.d.abueg@kp.org, kdeano@hotmail.com

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Oncology practice is in the era of precision medicine characterized by molecularly targeted therapies and genomic assays designed to tailor a treatment plan to individual patients. The chemotherapy era, in contrast, was marked by a reliance on cytotoxic chemotherapies with grossly similar mechanisms and, as a result, consistent side-effect profiles. The traditional side-effect profile for cytotoxic chemotherapy regimens reflected their indiscriminate impact on rapidly dividing cells

throughout the body, with the largest intended impact being on rapidly dividing cancer cells. Although there are certainly drug-specific nuances, the core of most chemotherapy side-effects profiles consist of myelosuppression and its manifestations, cutaneous effects, and gastrointestinal alterations.[1] This paradigm reached widely across chemotherapy regimens and diseases lending itself well to "general chemotherapy education curriculum." Precision medicine has not only brought new drugs to the cancer armamentarium, but also new side effects, side-effect kinetics, and other key considerations that can greatly impact survival, quality of life, and the overall cancer experience.[2] The side-effect profiles of these agents vary widely, reflecting the diversity of their underlying molecular mechanisms. As a result, associated assessments, education, and interventions can vary greatly, underscoring a need for research and practice recommendations for oncology professionals. As the complexity of cancer treatments grows, patient care will benefit from interprofessional teams of clinicians with expertise in varying specialties to address complex physical, psychological, medical, and genetic issues resulting from this precision approach and all the resulting treatments.

Key Differences between Side Effects of Precision Medicine Regimens and Cytotoxic Chemotherapy

At least three distinct observations distinguish the side-effect profiles of precision medicine regimens from their cytotoxic chemotherapy predecessors (Table 1). The first observation is simply a widened variety of symptoms. The subsequent articles in this issue will provide in-depth perspectives of organ-specific side-effect profiles. The "new" common side effects include maculopapular rash, QTc prolongation, hyperglycemia, hypertension, hypothyroidism, pneumonitis, hypertension, and autoimmune dysfunction.[2] Second, the timing and trajectory of side effects has changed significantly, reflecting drug pharmacokinetics of new agents, duration of therapy, and drug mechanism of action. Chemotherapeutic regimens will often exert their most severe side effects within 48 to 72 hours of infusion, with significant improvement before next dose.[1] Patient education often occurred "while in the chair prior to dose" and assessment for toxicity resolution occurring before the next dose. The trajectory observed with targeted therapies shifts to longer lasting toxicities with periodic waves of flare and resolution.[2-4] The kinetics of newer agents will require oncology teams to reformulate their assessment techniques to monitor patients who may be at home or may even have already completed treatment. Survivorship plans should be shared with interprofessional team members, such as primary care physicians and internal medicine specialists, so that they too may be aware of long onset toxicity and initiate management appropriately. The third concept affecting adverse event assessment is the observation that some toxicities may actually be indicators of benefit. Early discontinuation or reduction of drug because of the onset of such side effects may result in negative consequences.[5-9] For example, hypertension may be a predictive biomarker for clinical benefit in metastatic colorectal cancer patients.[8] Successful assessment and management requires an appreciation and understanding of mechanisms, physical presentation, and appropriate interventions. In other words, the scope and complexity of the symptoms that the

TABLE 1.
Comparison of Key Differences Between Traditional Cytotoxic Chemotherapy Regimens and Precision Medicine Regimens

Traditional Cytotoxic Chemotherapy	Precision Medicine Regimens
Common side-effects profile typically includes myelosuppression, gastrointestinal side effects, and cutaneous side effects	Common side effects include cardiac rhythm changes, hyperglycemia, hypothyroidism, pneumonitis, hypertension, and autoimmune dysfunction
Symptom timing often correlated with drug exposure	Symptom onset varies from hours to months, with periodic waves of flare and resolution that can persist after discontinuation of treatment
Adverse events usually an indicator for potential dose modification	Selected adverse events may not necessarily signal dose reduction and may be indicators of efficacy