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Review

Managing hypersensitivity reactions in cancer immunotherapy: A comprehensive nursing perspective

Ioanna Tsatsou*

One Day Clinic, Oncology-Hematology Department, Hellenic Air Force General Hospital, P. Kanellopoulou 3, 11523, Athens, Greece

* **Correspondence:** Email: itsatsou@uniwa.gr; Tel: +306983525725.

Abstract: Immunotherapy has transformed cancer treatment paradigms by harnessing the body's immune system to combat malignancies. However, hypersensitivity reactions (HSRs) associated with these agents pose significant challenges in oncology nursing. This review provides an in-depth analysis of HSRs to cancer immunotherapy regarding incidence, clinical manifestations, and management, and discusses the crucial role of nurses in early detection, patient education, and supportive care. A narrative review approach was used. Literature was systematically searched in PubMed, Embase, CINAHL, and Scopus databases for studies published up to 2025, focusing on immunotherapy-related HSRs, nursing management strategies, and evidence-based care guidelines. Relevant clinical guidelines and position statements from the American Society of Clinical Oncology (ASCO), the European Society for Medical Oncology (ESMO), and the National Comprehensive Cancer Network (NCCN) were also reviewed. Oncology nurses must be aware of HSRs and enhance their nursing practices in order to mitigate risks and optimize patient outcomes.

Keywords: immunotherapy; cancer; hypersensitivity reactions; oncology nurses

1. Introduction

Immunotherapy has revolutionized the treatment landscape of oncology, offering new hope for patients with previously limited therapeutic options. Agents such as immune checkpoint inhibitors (ICIs), monoclonal antibodies, and cellular therapies (e.g., CAR T-cell therapy) have demonstrated remarkable efficacy across a wide range of malignancies, including melanoma, lung cancer, renal cell

carcinoma, and hematological malignancies. These therapies harness the body's immune system to recognize and eliminate cancer cells, thereby achieving durable responses in a subset of patients [1].

Despite their promise, immunotherapy agents are associated with a spectrum of adverse effects, with hypersensitivity reactions (HSRs) constituting a significant and potentially life-threatening concern. HSRs can manifest during or after infusion, ranging from mild skin rashes to severe anaphylaxis. These reactions may be immune-mediated (IgE or non-IgE dependent), cytokine release–driven, or pseudoallergic in nature. The complexity of the underlying mechanisms, as well as the variability in onset and severity, often makes recognition and management challenging [2].

Nurses are at the forefront of cancer care and are essential in recognizing, conveying, and addressing safety threats [3], especially in the early detection, intervention, and prevention of hypersensitivity reactions. Their responsibilities span from pre-infusion assessment, patient education, and monitoring during administration to emergency response and post-reaction care [4].

As cancer immunotherapy continues to evolve and expand into standard care protocols, the responsibilities of oncology nurses will continue to evolve [5]. The nursing workforce must be equipped with evidence-based knowledge, clinical decision-making tools, and practical algorithms to address these critical reactions effectively.

This narrative review aims to synthesize current evidence on HSRs to immunotherapy agents and to delineate comprehensive nursing strategies for managing such events.

2. Methods

Existing literature was reviewed in order to synthesize current knowledge and clinical insights into HSRs associated with cancer immunotherapy, with an emphasis on nursing care and implications. The literature search was conducted across multiple electronic databases, including PubMed, Embase, CINAHL, and Scopus, covering publications up to 2025. Keywords and search terms included combinations of "hypersensitivity reactions", "immunotherapy", "cancer", "immune checkpoint inhibitors", "nursing care", "management", "assessment", and "adverse events". Relevant studies, clinical guidelines, and position statements from major oncology organizations such as the American Society of Clinical Oncology (ASCO), the European Society for Medical Oncology (ESMO), and the National Comprehensive Cancer Network (NCCN) were also reviewed to incorporate expert consensus and practice recommendations. Data from the selected literature were analyzed and synthesized to capture the range of HSRs, their incidence rates, nursing responsibilities during patient care, and outcomes. The findings were structured to support a comprehensive understanding of the topic from a nursing perspective, with the goal of informing evidence-based practice and clinical decision-making in oncology settings.

3. Results

3.1. Types of immunotherapy agents and associated HSRs

Different immunotherapy agents demonstrate varying propensities for inducing hypersensitivity reactions [6] (Table 1). Immune checkpoint inhibitors (ICIs) such as nivolumab and pembrolizumab commonly lead to dermatologic reactions, including rash and pruritus, but can also cause severe events like pneumonitis. These reactions occur in approximately 15%–30% of treated individuals [6,7].

In the context of cancer immunotherapy, the term HSRs is sometimes used broadly, but it is important to distinguish between immediate infusion-related HSRs and delayed immune-mediated toxicities (IMTs), also referred to as immune-related adverse events (irAEs). Immediate HSRs occur during or shortly after drug infusion and are typically IgE- or cytokine-mediated. They include symptoms such as flushing, rash, dyspnea, and anaphylaxis. Delayed reactions (IMTs/irAEs) emerge days to weeks after administration and are caused by immune system activation rather than classical hypersensitivity mechanisms, leading to conditions such as pneumonitis, colitis, or endocrinopathies [2,6,7].

For clarity, in this review, HSRs will refer primarily to immediate or infusion-related reactions, whereas delayed immune-mediated toxicities will be noted separately when relevant. This distinction is essential for nursing management, as immediate reactions demand acute emergency response protocols, while delayed events require longitudinal monitoring and patient education.

Monoclonal antibodies (mAbs), particularly rituximab and trastuzumab, have a well-documented history of infusion-related reactions. The literature indicates that between 20% and 77% of patients may experience some form of reaction during administration, often related to cytokine release. These reactions tend to decrease in frequency with subsequent infusions [8,9].

Cytokines, including interleukin-2 (IL-2) and interferon-alpha, also produce high rates of hypersensitivity-like symptoms, especially flu-like syndromes, chills, and hypotension [10,11]. Cancer vaccines such as Sipuleucel-T are less frequently associated with severe HSRs, though localized reactions at injection sites and flu-like symptoms are commonly reported. The combination of vaccines and ICIs has the potential to enhance immunogenicity and alter the immunosuppressive tumor microenvironment [12].

Table 1. Common HSRs and incidence per immunotherapy type.

Immunotherapy category	Example agents	Predominant reaction type	Typical timing	Common clinical features	Approx. incidence (%)
Immune checkpoint inhibitors (ICIs)	Nivolumab, Pembrolizumab	Delayed immune-mediated toxicities (can rarely be immediate infusion-related)	Days to weeks after administration	Rash, pruritus, colitis, pneumonitis, endocrinopathies	15–30
Monoclonal antibodies (mAbs)	Rituximab, Trastuzumab	Immediate infusion-related hypersensitivity reactions	During or within hours of infusion	Flushing, dyspnea, fever, chills, anaphylaxis	20–77
Cytokine therapies	Interleukin-2, Interferon-α	Acute cytokine-mediated reactions	Within hours of infusion	Fever, rigors, hypotension, flu-like syndrome	40–50
Therapeutic cancer vaccines	Sipuleucel-T, peptide-based vaccines	Mixed reactions: mild local (immediate) and systemic immune activation (delayed)	Minutes to days after injection	Injection-site erythema, fatigue, fever, myalgia	10–25
Emerging immune modulators/boosters*	Natural compounds, immune-stimulating adjuvants	Variable immune activation or hypersensitivity potential	Variable (hours to weeks)	Rash, fever, fatigue, autoimmune-like symptoms	Not well defined

*Includes nutraceuticals and biologically active compounds currently investigated as adjuncts to immunotherapy.

3.2. Clinical presentation of HSRs

The clinical presentation and timing of HSRs vary significantly depending on whether the reaction is immediate (infusion-related) or delayed (immune-mediated). Understanding this temporal distinction allows nurses to tailor monitoring and management appropriately during and after immunotherapy administration.

Hypersensitivity reactions are graded based on severity and symptomatology [13] (Table 2). Grade I reactions are mild, such as localized rash or flushing, and usually resolve without the need for treatment cessation. Grade II reactions are more widespread and may include dyspnea and gastrointestinal symptoms. Severe reactions, including bronchospasm and hypotension, are categorized as Grades III and IV. Grade IV reactions represent full-blown anaphylaxis, requiring immediate administration of epinephrine and advanced cardiac life support [2,13–15]. Nurses must be trained to differentiate among these grades and respond promptly.

In clinical practice, distinguishing Grade I from Grade II hypersensitivity reactions is essential because it determines whether treatment can continue or must be paused. Grade I (mild) reactions are limited, transient, and localized. Typical findings include isolated skin manifestations such as mild erythema, itching, or flushing without respiratory or gastrointestinal involvement. The patient remains hemodynamically stable, and symptoms resolve with observation or a single antihistamine dose. Grade II (moderate) reactions extend beyond the infusion site or skin, often presenting with more generalized rash, urticaria, mild dyspnea, or nausea. Vital signs may show mild changes (e.g., slight tachycardia or reduced oxygen saturation, >92%), but the patient remains stable after supportive therapy. These reactions require temporary cessation of infusion and close monitoring before potential rechallenge at a slower rate [13–16].

Nurses can differentiate grades by assessing the extent of symptoms, the presence of systemic involvement, and the patient's response to initial interventions. Accurate grading ensures appropriate escalation—from simple observation (Grade I) to physician notification and treatment modification (Grade II).

Table 2. Clinical presentation of HSRs.

Grade	Symptoms	Required interventions
I	Localized rash, flushing, pruritus	Observation, antihistamines
II	Generalized rash, mild dyspnea, nausea	Temporary cessation, supportive therapy
III	Hypotension, bronchospasm, severe dyspnea, chest tightness	Emergency drugs, hospitalization
IV	Anaphylaxis, cardiac arrest	Epinephrine, advanced cardiac life support

3.3. Risk factors for HSRs

Certain patients are more prone to HSRs due to specific clinical and biological risk factors. These include a prior history of allergic reactions or atopy, prior exposure to biological agents, high tumor burden, and female sex. Additionally, rapid infusion rates and pre-existing autoimmune conditions significantly elevate the risk [16].

Understanding these risk factors is critical for developing individualized premedication strategies and surveillance protocols. Oncology nurses play a pivotal role in reviewing medical histories and coordinating care plans to minimize the risk [17].

3.4. Management protocols

The management of HSRs during immunotherapy requires a structured, multidisciplinary approach, with oncology nurses playing a crucial role in ensuring patient safety. Effective protocols integrate pre-infusion assessments, real-time clinical interventions, post-reaction evaluation, and ongoing patient education. A summary of HSRs management is provided in Table 3.

Table 3. Summary of HSRs management.

Reaction grade	Premedication strategy	Infusion adjustment	Emergency intervention
I–II	Antihistamines, corticosteroids	Slow rate, close monitoring	Oxygen, IV fluids as needed
III–IV	Hospital setting, full emergency kit	ICU-level monitoring, desensitization	Epinephrine, airway management

3.4.1. Pre-infusion protocols

Pre-treatment assessment is the cornerstone of HSR prevention. Nurses must thoroughly review each patient's medical history, with emphasis on allergy history, prior drug reactions, comorbidities, and previous exposure to biologics or chemotherapy [18].

High-risk patients may benefit from premedication protocols involving corticosteroids, antihistamines, or acetaminophen, tailored in collaboration with oncologists and pharmacists. Nurses should verify premedication orders (e.g., antihistamines, corticosteroids, antipyretics), and ensure that emergency medications (e.g., epinephrine, diphenhydramine, hydrocortisone) and resuscitation equipment are readily available [19,20]

Especially, at initial infusions, nurses are responsible for educating the patient about possible symptoms of HSRs and the importance of prompt reporting [21].

3.4.2. Monitoring during infusion

During infusion, close patient monitoring is essential. Nurses must observe for early signs such as pruritus, flushing, dyspnea, or anxiety. Nurses must observe patients continuously, taking vital signs, especially during initial infusions, for any early signs of hypersensitivity. Signs of mild reactions (Grade 1) may include flushing, pruritus, or nasal congestion; moderate to severe reactions (Grade 2–4) may involve bronchospasm, hypotension, or anaphylaxis [15,22].

Adherence to infusion guidelines, including slow initial rates and escalation protocols, is critical to minimizing risk and modifying infusion rates based on symptoms and institutional protocols. Also, nurses use clinical judgment to escalate care, including stopping the infusion and activating emergency response for Grade 3–4 reactions. Immediate access to emergency medications (e.g., epinephrine, oxygen, IV corticosteroids) and resuscitation equipment is mandatory, and nurses must be aware of the emergency medications and initiating supportive measures (e.g., oxygen therapy, IV fluids). In cases of a suspected HSR, prompt intervention and clear documentation are vital. Nurses should stop the infusion immediately,

assess vital signs, initiate emergency protocols based on institutional guidelines, and provide supportive care. Accurate recording of reaction onset, symptoms, interventions, and outcomes aids future care decisions and may support pharmacovigilance efforts [23–25].

3.4.3 Acute response protocols

Immediate nursing actions during a suspected HSR include:

- Stopping the infusion immediately.
- Assessing airway, breathing, and circulation (ABC).
- Administering emergency medications as per standing orders or rapid response protocols:
  - IM epinephrine (0.3–0.5 mg) for anaphylaxis.
  - IV hydrocortisone or methylprednisolone.
  - H1/H2 blockers (e.g., diphenhydramine, ranitidine).
  - Inhaled beta-agonists (e.g., albuterol) for bronchospasm.
- Notifying the physician or advanced practice provider and initiating a code if indicated.
- Documenting the reaction, including time of onset, symptoms, interventions administered, and patient response [2,15,23,24,26].

3.4.4. Post-reaction protocols

After stabilization of the patient following a HSR, nursing responsibilities remain critical in ensuring patient safety and continuity of care. Nurses must continue to monitor vital signs in close intervals and assess symptom resolution, documenting all findings meticulously [26].

A thorough record of the sequence of events should be entered using standardized adverse event reporting tools and electronic health record systems, ensuring transparency and continuity across the care team. In parallel, the reaction should be formally reported to the institution's pharmacovigilance unit and, where applicable, to national adverse event databases, in accordance with regulatory guidelines [27]. Effective coordination with the broader oncology team is essential to reassess the treatment plan; depending on the severity and nature of the reaction, this may include permanent discontinuation of the immunotherapy agent, dose adjustment, implementation of desensitization protocols, or selection of alternative therapies.

3.4.5. Rechallenge and desensitization protocols

In cases where re-treatment with the implicated immunotherapy agent is clinically indicated and deemed safe, desensitization protocols may be implemented. These protocols involve the gradual, stepwise reintroduction of the offending drug in controlled doses, administered under close medical supervision [28].

Nurses play a central role in the execution of desensitization procedures, including the preparation and verification of incremental doses in collaboration with pharmacy staff, continuous monitoring of the patient throughout each phase for signs of recurrent hypersensitivity, and prompt administration of adjunct medications such as antihistamines or corticosteroids when necessary [26]. Comprehensive documentation of the entire process is essential to ensure patient safety, facilitate team communication, and support ongoing pharmacovigilance efforts.

3.4.6. Patient and family education

Patient education is a continuous and integral component of nursing care, particularly in the context of immunotherapy-related HSRs. Empowering patients to recognize and respond to delayed symptoms significantly enhances treatment safety and outcomes [21,29].

Nurses are responsible for providing clear verbal and written instructions on the signs and symptoms of delayed hypersensitivity reactions, emphasizing the importance of timely reporting and strict adherence to scheduled follow-up appointments. The use of simple, non-technical language and visual aids—such as charts, infographics, or illustrated symptom guides—can greatly enhance patient understanding, especially for those undergoing complex, multimodal cancer therapies. Additionally, employing communication strategies such as the teach-back method helps verify patient comprehension, which is especially important for elderly individuals or those with limited health literacy. By fostering active patient engagement and awareness, nurses play a pivotal role in the early identification and effective management of adverse events, ultimately promoting safer and more personalized cancer care [30].

4. Care pathways

Care pathways and guidelines serve as essential instruments for delivering evidence-based care in the field of oncology. Pathways tend to be more restrictive than guidelines as they strive (when feasible) to minimize costs, increase efficiency, and eliminate unnecessary variability. They present an opportunity to assess, document, and enhance the quality of care, facilitate evidence-based targeted therapies when suitable, improve efficiency through standardization, and ultimately, act as a means to boost participation in clinical trials. The successful implementation of pathways necessitates thorough understanding and commitment from nurses, physicians, and leadership, as they may initially disrupt existing workflows, yet they possess the potential to significantly improve patient care [31].

Creating standardized care pathways for HSRs associated with cancer immunotherapy is crucial to guarantee uniform, safe, and effective patient care. These structured protocols guide oncology nurses and multidisciplinary teams in the early identification, acute management, and post-reaction follow-up of patients receiving immunotherapeutic agents [32].

A comprehensive care pathway begins with risk stratification during the pre-treatment phase. This includes assessing allergy history, prior drug reactions, comorbidities, and baseline laboratory parameters. High-risk patients are flagged for enhanced monitoring and may receive tailored pre-medication regimens, such as corticosteroids, H1/H2 blockers, and acetaminophen. Nurses are responsible for ensuring pre-treatment checklists are completed and all emergency supplies are readily accessible [26,33–35].

During infusion, the care pathway includes real-time monitoring and intervention algorithms. Nurses are trained to recognize early signs of hypersensitivity, like rash, flushing, chest tightness, or respiratory changes, and to escalate care based on severity. Algorithms typically include a stepwise plan (stop the infusion, administer rescue medications) and initiate emergency response protocols if needed. This pathway must be rehearsed regularly in simulation training to enhance team readiness [26,34].

Post-reaction care pathways guide the evaluation and documentation of the event. This includes detailed charting, adverse event reporting, and multidisciplinary review to determine whether re-challenge, desensitization, or agent substitution is appropriate. Nurses play a key role in coordinating

follow-up care, educating patients about delayed reactions, and scheduling timely assessments with oncology and allergy specialists [26,35].

Integration of care pathways into electronic health records can enhance efficiency and standardization. Furthermore, institutions should support pathway development with regular audits, feedback loops, and quality improvement initiatives to adapt protocols to emerging therapies and evidence. These standardized approaches empower oncology nurses to deliver high-quality, evidence-based care while minimizing risk and improving patient outcomes in immunotherapy [35].

5. Nursing algorithm for HSRs during cancer immunotherapy

Based on the above, a nursing algorithm is proposed (Figure 1).

Step 1: Baseline preparation (before infusion)

- Review allergy history, previous reactions to biologics or chemotherapy
- Ensure premedication is administered (antihistamines, corticosteroids, acetaminophen if ordered)
- Confirm availability of emergency drugs: epinephrine, diphenhydramine, hydrocortisone, bronchodilators
- Ensure resuscitation equipment and oxygen are accessible
- Educate patient on signs/symptoms of HSR and instruct them to report immediately

Step 2: During infusion: Monitor and recognize

Early warning signs (mild to moderate)

- Flushing, rash, itching
- Throat tightness
- Coughing, mild dyspnea
- Nausea/vomiting
- Fever/chills

Severe symptoms

- Hypotension
- Bronchospasm, wheezing, stridor
- Oxygen desaturation (<92%)
- Angioedema
- Loss of consciousness

Step 3: Immediate action based on severity

- *Grade 1 (mild):*
  - Slow or pause infusion
  - Administer antihistamines
  - Monitor closely
  - Restart at slower rate if resolved
- *Grade 2 (moderate)*
  - Stop infusion immediately
  - Notify physician
  - Administer antihistamines ± corticosteroids
  - Provide oxygen if needed
  - Monitor vitals every 5–10 min

- Consider hospitalization

• *Grade 3–4 (severe or life-threatening)*

- Stop infusion immediately
- Call Code Blue/emergency response
- Administer: IM epinephrine (0.3–0.5 mg), IV corticosteroids (e.g., hydrocortisone 100 mg), antihistamines, oxygen and airway support
- Initiate IV fluids for hypotension
- Document event in detail
- Report as an adverse drug reaction

Step 4: Post-reaction care

- Monitor patient until fully stabilized
- Document time of onset, symptoms, vitals, interventions, and patient response
- Submit adverse drug reaction report (hospital and pharmacovigilance authority)
- Educate patient and family on what occurred and next steps
- Schedule allergy/immunology consultation if necessary
- Collaborate with oncology team to determine rechallenge, desensitization, or therapy modification

Step 5: Follow-up and quality improvement

- Participate in debriefing session
- Update institutional care pathway or standard operating procedure if indicated
- Reinforce team training and simulation exercises
- Ensure patient is informed about signs of delayed hypersensitivity

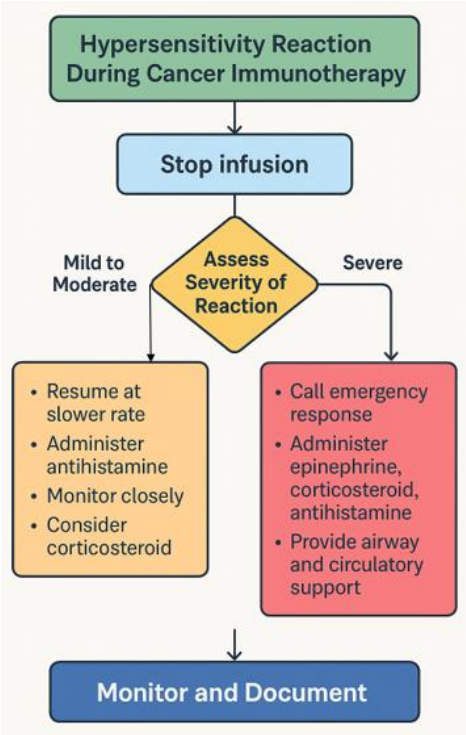

Figure 1. Proposed nursing algorithm for HSRs.

6. Discussion

The increase in HSRs associated with immunotherapy agents reflects the complex interaction between cancer, the immune system, and biologic treatments. While ICIs offer promising outcomes, their potential to provoke immune-mediated events such as dermatitis, colitis, and endocrinopathies presents a significant challenge [36]. The nursing role is critical in triaging these reactions, differentiating them from disease progression or infections, and supporting multidisciplinary care.

Nurses serve as frontline observers in oncology settings and are essential to the early recognition and management of HSRs to immunotherapy. Their responsibilities include the rapid identification of clinical signs and symptoms indicative of a reaction and the immediate execution of emergency protocols. Accurate and detailed documentation of the event, including onset, severity, and response to treatment, is critical for clinical decision-making and future care planning. Additionally, nurses play a key role in patient education, instructing individuals on how to recognize delayed or progressive symptoms and when to seek urgent care. Patient education remains a cornerstone of effective management [33].

Adequate training in these areas, supported by structured clinical guidelines, significantly improves the safety and quality of immunotherapy delivery in oncology practice. Future directions should include simulation training for oncology nurses [37], standardized care pathways for HSRs [38], and the development of predictive biomarkers for hypersensitivity [39].

6.1. Challenges in oncology nursing

The emergence of immunotherapy as a cornerstone of cancer treatment has significantly expanded the responsibilities of oncology nurses. While these agents have improved survival in many malignancies, they also introduce a unique set of challenges, particularly related to immune-related hypersensitivity reactions (HSRs). Nurses must be equipped to manage these complexities, yet several key challenges persist.

One of the foremost difficulties lies in the unpredictable nature and delayed onset of HSRs associated with immunotherapy agents such as ICIs and monoclonal antibodies. Unlike conventional chemotherapy, immunotherapy can cause reactions that manifest days to months after treatment, complicating detection and timely intervention [40]. Nurses must maintain vigilance far beyond infusion sessions, requiring extended monitoring and follow-up care.

Differentiating HSRs from other complications, including infection, disease progression, or autoimmune flare, is also a significant clinical challenge. The overlapping symptoms can mislead clinical judgment unless nurses possess detailed knowledge of immunotherapy mechanisms and toxicity profiles. Moreover, HSRs may initially mimic mild allergic responses that can rapidly escalate, emphasizing the need for real-time assessment skills and familiarity with emergency protocols [41].

There are also educational gaps and institutional barriers. Many oncology nurses report limited formal training in immunotherapy toxicities and insufficient access to structured desensitization or hypersensitivity management protocols. This variability can lead to delayed care or inconsistent practices across healthcare settings.

Communication challenges further complicate management. Patients may not recognize early signs of hypersensitivity or may underreport symptoms due to fear of treatment interruption. Nurses must bridge this gap through proactive education and therapeutic communication.

Also, interdisciplinary collaboration strengthens outcomes. Nurses should actively participate in team discussions regarding treatment adjustments, desensitization protocols, or drug substitutions. Regular continuing education and simulation-based training are recommended to maintain competency and confidence in managing these complex reactions.

Finally, the emotional toll of managing acute, potentially life-threatening reactions can contribute to stress and burnout among oncology nursing staff [42]. Institutions must address this with ongoing psychosocial support.

6.2. Immune boosters, vaccines, and emerging adjuncts in immunotherapy

The integration of immune boosters and vaccination strategies offers new perspectives in optimizing cancer immunotherapy outcomes. Recent research emphasizes that certain natural and synthetic immune modulators may enhance immune surveillance, reduce treatment-related immunosuppression, and support recovery following hypersensitivity reactions [43]. Bioactive compounds such as myricetin and caffeic acid phenethyl ester exhibit promising immunomodulatory and anticancer properties, potentially acting as complementary agents to reduce toxicity and improve patient resilience [43,44].

These developments have significant implications for oncology nursing practice and the management of HSRs. From a nursing standpoint, awareness of these emerging adjuncts is important for holistic care planning, patient education, and long-term immune health maintenance. Also, these advancements introduce new responsibilities in assessing potential interactions, monitoring immune-related toxicities, and educating patients about the unregulated use of supplements that may influence treatment response or hypersensitivity risk.

In parallel, next-generation vaccines are being explored for their role in enhancing antiviral and antitumor immunity, particularly in immunocompromised cancer populations. Advances in vaccine technologies, including mRNA and AI-driven design, hold promise for preventing viral infections that may exacerbate immunotherapy-induced complications [45,46]. Nurses contribute significantly to vaccine administration, monitoring for post-vaccination hypersensitivity, and educating patients about vaccine safety, particularly in immunocompromised oncology populations. Also, for nurses, understanding these technologies is vital to integrate digital monitoring tools, interpret AI-assisted clinical alerts, and contribute to multidisciplinary data collection on adverse immune events.

Furthermore, the interplay between the lymphatic and immune systems is critical in the regulation of hypersensitivity and treatment tolerance. Integrative approaches that promote lymphatic health and natural immune balance may contribute to reduced incidence or severity of HSRs during immunotherapy [47]. Overall, integrating immune boosters and vaccine strategies into oncology care requires nurses to balance innovation with vigilance, ensuring that immune enhancement does not increase the risk or severity of hypersensitivity reactions.

7. Conclusions

Hypersensitivity reactions to immunotherapy agents in oncology are an important concern requiring vigilance and clinical skill. Nursing professionals are integral to the successful management of these reactions, and their proactive involvement can significantly reduce morbidity and improve therapeutic outcomes. Training, education, and support are essential to empower nurses in managing this complex aspect of modern cancer care.

Use of AI tools declaration

The author declares she has not used Artificial Intelligence (AI) tools in the creation of this article, except from the figure creation.

Conflict of interest

The author declares no conflict of interest.

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