# Air-in-Line Alarms

## Decreasing alarms through antisiphon valve implementation

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The administration of 24-hour continuous chemotherapy infusions is common in certain regimens, such as EPOCH (etoposide, prednisone, vincristine, cyclophosphamide, and doxorubicin). Such regimens are notorious for clinically insignificant air-in-line (AIL) alarms because of the naturally bubbly composition of the drugs involved. An antisiphon valve, placed at the end of the IV tubing to pressurize the infusion and to minimize air bubbles, was found to decrease clinically insignificant AIL alarms. The positive outcomes of the current study could be applied to other infusions known for frequent clinically insignificant AIL alarms.

**AT A GLANCE**

- Nuisance AIL alarms may prolong infusion times, disrupt patients' sleep, and increase nursing workflow.
- A 92% decrease in AIL alarms was observed when comparing four weeks of infusion data before and after antisiphon valve implementation.
- The antisiphon valve must be manually primed via syringe or IV pump because it cannot be primed by gravity.

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antineoplastic protocols; drug delivery; infusion pumps; clinical alarms

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Chemotherapy infusions are one of the pillars of oncology treatment. However, some infusions are notorious for triggering frequent and clinically insignificant air-in-line (AIL) alarms. These alarms can contribute to alarm fatigue, negatively affecting nurses and patients. In a comprehensive review, Shah, Irizarry, and O'Neill (2018) evaluated alerts and alarms with smart infusion pumps, finding no consensus regarding the amount of air a patient may safely receive via an infusion and no published evidence addressing strategies to decrease AIL alarms.

Alarm fatigue is a ubiquitous problem in hospitals and may desensitize clinicians to medical device sounds, leading to workarounds, such as turning down alarm volume or adjusting device settings (Joint Commission, 2013). Despite the generally positive intentions of technologic enhancements, nurses have described the increasing amount of medical device alarm and alert sounds as constant, noxious, and a nuisance (Honan et al., 2015). In a 2016 survey of more than 1,200 healthcare team members, respondents stated that alarms occurred frequently (87%) and disrupted patient care (86%), causing caregivers to distrust and disable the alarms (Ruppel et al., 2018).

The Joint Commission (2013) recommends various strategies to reduce nuisance alarms, including identifying opportunities for improvement through a review of trends and patterns of alarms. In addition, nuisance AIL alarms have the potential to prolong infusion times, disrupt patients' sleep (AAMI Foundation, 2015), and increase nursing workflow.

### Clinically Insignificant Air-in-Line Alarms

There is a paucity of primary literature addressing the topic of gaseous chemotherapy infusions and the resultant clinically insignificant AIL alarms. Based on a literature search of CINAHL®, Google Scholar™, and PubMed®, the clinical rationale for why some infusions are gaseous and prompt small air bubbles during the infusion is not documented.

Notable discussion has taken place in the Oncology Nursing Society's (ONS's) online community, particularly its All ONS Member Community board, regarding the management of AIL alarms. Community members have described nuisance AIL issues with infusions including etoposide, rituximab, IV immunoglobulin, and mixed chemotherapies (Atkins, 2017; Fischer-Cartlidge, 2017; Schumann, 2017). According to posts from community members, some organizations have instituted the use of an antisiphon valve to pressurize the infusion, decreasing air bubbles in the line and, ultimately, the number of AIL alarms (Rodriguez, 2017; Sunago, 2017). In addition, through interactions and discussions with infusion pump consultants, knowledge was shared regarding the successful use of the antisiphon valve in other organizations.

### Valve Implementation

Some chemotherapy regimens require continuous 24-hour infusions (National