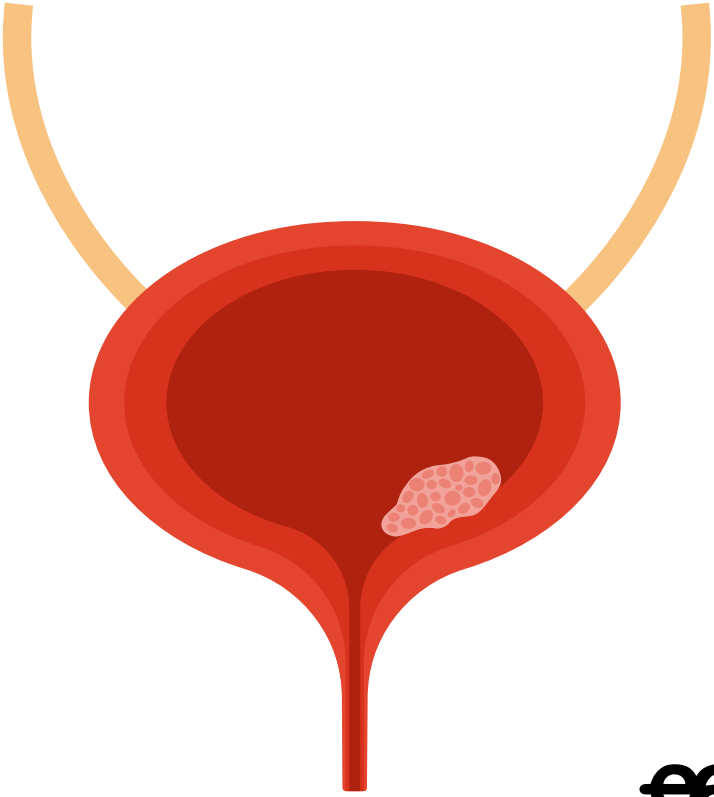
EAUN Guidelines on

Intravesical instillation

with mitomycin C and bacillus Calmette-Guérin in non-muscle-invasive bladder cancer

2026



European Association of Urology Nurses

EAUN Guidelines on

Intravesical instillation

with mitomycin C and bacillus Calmette-Guérin in non-muscle-invasive bladder cancer

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1. Introduction

1.1 Aim and scope

The European Association of Urology Nurses (EAUN) was created in April 2000 to represent European urology nurses. The EAUN's underlying goal is to foster the highest standards of urological nursing care throughout Europe, with the aim of directly helping our members develop or update their expertise.

The EAUN Guidelines Panel has prepared these Guidelines with the aim of increasing the quality of care for patients receiving intravesical instillations of mitomycin C or Bacillus Calmette-Guérin (BCG) in non-muscle invasive bladder cancer (NMIBC). The Guidelines are intended to support nurses and practitioners who are already competent in the procedure of intravesical instillations. Importantly, the Guidelines also highlight the psychological and social aspects unique to patients undergoing intravesical instillations, with a focus on quality of life (QoL). The Guidelines should be applied within the context of local policies and existing protocols.

The Guidelines provide clear illustrations and annotated procedures to help nurses identify potential problem areas and safely carry out effective patient care and address the following points:

- indications and contraindications
- safety precautions
- nursing interventions
- interventions in intravesical instillations
- aspects of patient education and patient perspectives

It must be emphasised that, although clinical guidelines present the best evidence available to the experts, following guideline recommendations will not necessarily result in the best outcome. Guidelines can never replace clinical expertise when making treatment decisions for individual patients but rather help to focus decisions - including considering the personal values and preferences/individual circumstances of patients and their caregivers. The Guidelines are not mandates and do not purport to be a legal standard of care.

1.1.1 Role of the nurse in different countries

EAUN is a professional organisation of European nurses who specialise in urological care. The level of education and practical training of nurses in urology varies widely throughout Europe, with the roles and responsibilities of nurses differing among countries. This makes it difficult for any guideline to fulfil all requirements or expectations of individual practitioners. The EAUN, however, aims to ensure that

every nurse and healthcare professional will benefits from using these guidelines. Job titles often differ within the specialty in different countries, and even in different areas within the same country. Therefore, in this document, the term 'nurses' is understood to refer to all nurses working with intravesical instillation as specialised nurses.

1.2 Panel composition

The EAUN Guidelines Panel on Intravesical Instillation with Mitomycin C or BCG in NMIBC consists of an international group of nurse practitioners and clinicians with particular expertise in this area. All the experts involved in the production of this document have submitted a potential conflict of interest (COI) disclosure form, all of which are available upon request.

1.3 Publication history

The EAUN Guidelines on Intravesical Instillations were first published in 2015. This 2026 publication has been updated throughout and developed using an updated methodology as detailed in the Methodology chapter. An open access version of the text and a downloadable PDF are available on the EAUN website: www.eaun.org/guidelines.

1.4 Summary of changes

For the 2026 guidelines update new and relevant evidence was identified, collated and appraised through a structured assessment of the literature for all sections of the guidelines. The guidelines text has been carefully reviewed and updated accordingly. The recommendations have been reviewed in full and reworked to aid practical implementation. Specific changes include:

- **5.1 Contraindications for intravesical instillations** - The categorisation of UTI as localised UTI (e.g. "cystitis") or systemic UTI according to the 2025 EAU Guidelines of Urological Infections: www.uroweb.org/guidelines/urological-infections.

- **10.1 Patient assessment** - Prior to both initial and subsequent administrations of intravesical therapy, patients must be assessed before and after each instillation, focusing on overall health status and symptoms indicative of UTI. Dip-stick testing alone is not recommended for ruling out UTI. Clinical evaluation is essential to avoid unnecessary antibiotic use, thereby supporting antibiotic stewardship and reducing the risk of antimicrobial resistance.

- **10.2 Pre-procedure nutrition** - Consistent evidence has established the critical role of nutrition as the fourth pillar in cancer care. Despite evidence showing that integrating adequate nutritional care into standard cancer care, positively impacts relevant clinical outcomes; health related quality of life (HRQoL) and reduction of

toxicities or complications, there remain limited studies of the impact of nutrition in NMIBC.

- **12 Patient Quality of Life -** There is an emerging understanding of the impact on HRQoL on NMIBC cancer treatment. Systematic reviews have found that NMIBC patients have a substantial symptom and functional burden that impacts HRQoL throughout the induction period of treatment but returns to baseline level by the end of the maintenance period of treatment. New longitudinal data also document that HRQoL is comparable with that of the general population after four years.

- **13 Patient experience** - Patient experience is added to this update acknowledging that patient experience and preferences are important to facilitate adherence to treatment.

2. Methodology

2.1 Data identification

For these 2026 Guidelines on Intravesical Instillation, new and relevant evidence has been identified, collated and appraised by means of a structured assessment of the literature. A broad and comprehensive scoping exercise covering all areas of the Guidelines was also carried out. Databases searched included Medline, EMBASE the Cochrane Libraries and CINAHL, restricted to the English language and covering a time frame between January 2015 and 1 June 2024. A total of 1,955 unique records were identified, retrieved and screened for relevance. The Working Group added relevant references that were received after the search period during the document review. A total of 66 new references were added to the 2026 Guidelines. Detailed search strategies are provided in Appendix 1.

Recommendations within the Guidelines are developed by the panel to prioritise clinically important care decisions. Recommendations in this text are assessed according to their level of evidence (LE) and Guidelines are given a grade of recommendation (GR) according to a classification system based on the Oxford Centre for Evidence-Based Medicine Levels of Evidence [1].

Table 1. Level of evidence*

LE	Type of evidence
1a	Evidence obtained from meta-analysis of randomised trials
1b	Evidence obtained from at least one randomised trial
2a	Evidence obtained from one well-designed controlled study without randomisation
2b	Evidence obtained from at least one other type of well-designed, quasi-experimental study
3	Evidence obtained from well-designed, non-experimental studies, such as comparative studies, correlation studies and case reports
4	Evidence obtained from expert committee reports or opinions or clinical experience of respected authorities**

Table 2. Grade of recommendation*

Grade	Type of evidence – Nature of recommendation
A	Based on clinical studies of good quality and consistency addressing the specific recommendations and including at least one randomised trial
B	Based on well-conducted clinical studies, but without randomised clinical trials
C	Made despite the absence of good quality, directly applicable clinical studies

* Modified from [1]

**Including qualitative studies

2.2 Review

This 2026 publication was peer reviewed prior to publication. A blinded review was carried out by specialised nurses and urologists in various countries. A final version was approved by the EAUN Board.

3. Epidemiology and aetiology

Bladder cancer (BC) is the seventh and tenth most commonly diagnosed cancer in males and females worldwide, respectively [2]. The worldwide age-standardised incidence rate (per 100,000 person/years) is 9.5 in men and 2.4 in women [2]. In the European Union, the age-standardised incidence rate is 20 in men and 4.6 in women [2]. Approximately 75% of patients with BC present with a disease confined to the mucosa (stage Ta, CIS) or submucosa (stage T1). This percentage is even higher in younger patients (< 40 years of age) [3].

Tobacco smoking is the single most important risk factor for BC, accounting for approximately 50% of cases [4-7]. Occupational exposure to aromatic amines, polycyclic aromatic hydrocarbons and chlorinated hydrocarbons is the second most important risk factor for BC, accounting for approximately 10% of all cases. This type of occupational exposure occurs mainly in industrial plants that process paint, dye, metal and petroleum products [4, 5, 8, 9].

4. Terminology

4.1 Intravesical instillation

Intravesical instillation is a procedure by which fluids are slowly introduced into the bladder via a catheter and allowed to remain there for a specific length of time before being drained, voided or withdrawn. The procedure is performed to expose the tissues of a given area to the solution. This procedure enables drug delivery to the urothelium with reduced systemic side effects compared with oral or parental drug delivery [10]. The procedure is also referred to as 'bladder instillation', 'intravesical treatment' and 'intravesical therapy'. These Guidelines use the term 'intravesical instillation'.

4.2 Intravesical chemotherapy

Intravesical chemotherapy is intended to eradicate any surviving cancer cells in the bladder mucosa (so-called 'chemoresection' of the tumour) and, in case of immediate postoperative instillation, to destroy any floating tumour cells left behind by transurethral resection of the bladder tumour (TURBT) and prevent those floating tumour cells from implanting.

Mitomycin C (MMC) is a chemotherapeutic agent that inhibits DNA synthesis in tumour cells. MMC decreases the recurrence rate from 54% to 38% but has no impact on the risk of progression [11]. Other intravesical chemotherapeutic agents exist apart from MMC. Doxorubicin, epirubicin and thiotepa are used in some countries, however, the superiority of one drug over the others has not been demonstrated [12].

4.3 Intravesical immunotherapy

Immunotherapy aims to eradicate disease by provoking or enhancing the host immune response. Bacillus Calmette-Guérin is a live-attenuated strain of Mycobacterium bovis. When instilled into the bladder, Bacillus Calmette-Guérin triggers an immune response in the mucosa that eventually kills cancer cells. Immunotherapy aims to eradicate disease by provoking or enhancing the host immune response. BCG is a live attenuated strain of Mycobacterium bovis. When instilled into the bladder, it triggers an immune response when binding to fibrinogen in the bladder wall. It works in two ways; it has a direct cytotoxic effect as well as activating a variety of different immune cells, both of which results in killing of remaining tumour cells in the bladder. in the mucosa that eventually kills cancer cells . Bacteria in the suspension attach to the tumour cells and are absorbed. Consequently, immune cells such as granulocytes, macrophages and lymphocytes move into the tissue as a part of the inflammatory reaction, leading to tumour elimination. The less differentiated (i.e., more aggressive) the tumour, the more sensitive it is to BCG [13].

As discussed in the EAU Guidelines on NMIBC, studies have shown that BCG after TURBT is superior to TURBT alone or TURBT plus chemotherapy for preventing the recurrence of NMIBC [14].

A Cochrane systematic review confirmed that BCG is more effective in reducing the recurrence rate over MMC [15].

5. Primary treatment by disease type

The type of treatment after TURBT is primarily based on the risk of disease progression. Table 3 outlines the treatment recommendations per risk group as defined by the EAU Guidelines on NMIBC [14].

Table 3. Treatment according to tumour risk category as defined by the EAU Guidelines on NMIBC [14]

Risk category	Treatment
Low risk	A single post-operative instillation of chemotherapy reduces the risk of recurrence and is considered sufficient treatment in these patients. In all studies, the instillation was administered within 24 hours.
Intermediate risk	In these patients, induction chemotherapy with or without maintenance for a maximum of one year is a reasonable first-line option in the majority of patients [16]. An alternative option is one-year, full-dose BCG treatment (induction plus 3-weekly instillations at 3, 6 and 12 months). The final choice should reflect the individual patient's risk of recurrence and progression, as well as the efficacy and side effects of each treatment modality.
High risk	In these patients, full-dose intravesical BCG for one to 3 years (induction plus 3-weekly instillations at 3, 6, 12, 18, 24, 30 and 36 months) is indicated. Due to the high risk of progression, immediate radical cystectomy (RC) can also be discussed with the patient.
Very high risk	Immediate RC should be discussed with these patients. If RC is not feasible or refused by the patient, full-dose intravesical BCG for one to 3 years should be offered.

5.1 Contraindications for intravesical instillations

Intravesical administration of BCG and MMC is contraindicated in the following cases:

- in patients with visible haematuria
- any suspicion of extra- peritoneal or intraperitoneal bladder perforation
- hypersensitivity to the active substance
- breastfeeding [17]
- after traumatic catheterisation
- for two weeks after TURBT
- in patients with symptoms on both localised or systemic urinary tract infection (UTI) [18, 19]

Extravasation of chemotherapy may lead to serious adverse events. No data is available on the use of mitomycin in pregnant women. Mitomycin has a mutagenic, teratogenic and carcinogenic effect and therefore may impair the development of an embryo. Women must not become pregnant during treatment with mitomycin [17].

Asymptomatic bacteriuria, the presence of leukocyturia or nonvisible haematuria are not contraindications [18], and antibiotic prophylaxis is not necessary in these cases [20]. Other contraindications include active tuberculosis, hypersensitivity to BCG and previous radiotherapy of the bladder [18]. BCG should be used with caution in immunocompromised patients, although some small studies have shown similar efficacy and no increase in complications compared to non-immunocompromised patients. BCG administration is not recommended during pregnancy or when lactating, although relevant data are lacking [18].

5.1.1 Safety precautions for intravesical instillations

Atraumatic catheterisation is essential for the safe instillation of BCG. Major complications can appear after systemic drug absorption. Contraindications for BCG intravesical instillation should therefore be respected. In both cases nurses should observe the urine and ask the patient about UTI symptoms before the treatment and contact the physician in case of gross haematuria or signs of UTI.

6. Common treatment schedules

Various chemotherapy and BCG schedules have been described, with contradictory evidence in support of each. The following schedules, however, are most commonly used and it is recommended to follow local guidelines.

Chemotherapy (MMC): A single immediate, postoperative instillation or immediate postoperative instillation followed by six weekly instillations and then, if cystoscopy is negative, monthly instillations for a period of one year [21].

BCG: Administration should start no sooner than two weeks after TURBT and consists of six weekly instillations (induction course) followed by three weekly instillations (maintenance) at 3, 6, 12, 18, 24, 30 and 36 months, provided that cystoscopy and cytology are negative [22]. Maintenance in intermediate-risk patients stops after 12 months [14].

6.1 Device-assisted intravesical chemotherapy

The most commonly used devices are electromotive drug administration (EMDA), radiofrequency induced thermochemotherapeutic effect (RITE) and conductive hyperthermic chemotherapy (HIVEC). The RITE technology has been developed to induce hyperthermia using microwave radiation. With the EMDA technology, an electrical charge is generated between a cutaneous electrode and a catheter electrode to increase the transport of drug molecules into tissue. With HIVEC, the drug is heated externally and then delivered to the bladder. Overall, the evidence base for device-assisted intravesical chemotherapy is growing and the results of further studies are awaited.

6.2 Treatment after failure of intravesical therapy

Several categories of BCG failure have been proposed. NMIBC may not respond at all (BCG refractory) or may relapse after initial response (BCG relapsing). Please refer to the EAU Guidelines on NMIBC [14].

6.3 Alternatives to MMC and BCG

At present, the standard of care for low-risk patients is one immediate instillation of intravesical chemotherapy after TURBT [14]. For intermediate-risk patients in general, chemotherapy is a reasonable first-line option in the majority of patients with one year of full-dose BCG treatment as an alternative option [14]. For high-risk patients, full-dose BCG instillation for one to three years is standard, but immediate RC should be discussed. In BCG-unresponsive patients, RC is recommended [14].

Several trials investigating immune checkpoint inhibitors, targeted therapies, gene therapy, vaccines and alternative and combination chemotherapy regimens are running [23]. At present, however, alternative treatment options remain investigational, and their use is not recommended outside well-designed clinical trials.

7. Safety

Antineoplastic agents are potentially hazardous and must be handled with caution. While the risks associated with BCG and MMC differ, given that BCG is an attenuated vaccine and MMC is a cytotoxic drug, only MMC is listed as hazardous drug on the National Institute for Occupational Safety and Health (NIOSH) Alert List of the United States government public health agency the Centers for Disease Control (CDC). These substances have the potential to cause carcinogenic effects, developmental or reproductive toxicity and organ damage [24].

7.1 European safety regulations

The European Agency for Safety and Health at Work (EU-OSHA) aims to minimise any risk of mutagenic exposure to the population. European regulations are implemented within individual EU Member States, with each Member State responsible for developing local regulations based on the EU directive [25]. In the United States, healthcare worker safety is governed by the Occupational Safety and Health Administration (OSHA) [26].

To protect workers from exposure to carcinogenic toxins, the European Council issued a directive indicating the minimum safety requirements [27]. The directive makes the following recommendations (Article 5):

- Reduce sources of exposure: Use a biological safety cabinet when possible. It is at the discretion of the management/staff whether a closed system is to be used in accordance with the risk assessment performed and relevant legislation. The technical measures that are used should also be validated with appropriate monitoring techniques
- Evacuation of carcinogens at the source by local extraction or general ventilation: The use of clean rooms with biological safety cabinet or isolators when a closed system for the medication is not used
- Individual protection measures (personal protective equipment/PPE): The use of gloves, gowns, masks and protective clothing

Prevention against exposure is the highest goal to strive for when working with hazardous medication. The National Institute for Occupational Safety and Health in the United States also recommends that a closed system be used throughout the hazardous drug-handling chain, from pharmaceutical compounding to patient dose administration [28].

7.2 Risk factors and exposure

Both BCG and MMC pose significant health risks to individuals who are exposed to them during handling. These hazardous drugs are highly toxic, and as such, no permissible

exposure level has been established for them [29]. Research on occupational exposure has revealed that healthcare workers, particularly oncology nurses, face the highest risk of exposure to these drugs. These nurses, who are frequently exposed to carcinogenic agents, are at an increased risk of developing leukaemia, other cancers, genetic mutations and reproductive health issues, including miscarriages, infertility and congenital abnormalities. This heightened risk underscores the critical need for stringent safety protocols to protect healthcare workers from accidental exposure to these potent carcinogens [30-37].

Employers must assess the risk of handling antineoplastic and biological drugs and take suitable precautions to protect employees by identifying the hazards and deciding who might be harmed and how. Exposure during handling of BCG and MMC may be through skin absorption, eye contact, inhalation of aerosols and drug particles, ingestion and needle stick injuries during drug preparation and administration, handling of patient waste, transport and waste disposal, and cleaning of spillages.

People at risk of contamination include:
- Transporters of the medication before and after preparation
- Healthcare professionals: pharmacists/pharmacy assistants, nurses/nurses' assistants, operating room theatre technicians and doctors
- Cleaning personnel
- Handlers of waste
- Handlers of linen/bedding
- Patients
- Family members/people close to the patient

7.3 Risks during drug preparation

Spillage of medication often occurs at the connection points of syringes, tubes (such as infusion sets) and urinary catheters.

Measures to reduce exposure during sterile preparation should include the use of needle-free systems whenever possible. When needle-free systems are not feasible, appropriate precautions should be taken, such as using syringes with Luer-lock connections - commonly used to ensure a secure attachment that minimises the risk of needle or tube slippage and leakage. Additionally, air-venting devices should be utilised to reduce the aerosolization of hazardous drugs, which can pose an increased risk to the individual preparing MMC and BCG.

Additional precautions include the following [25]:
- If a closed system is not available, use a biological safety cabinet for preparation.

- Purge preparations with dissolvent.
- Use an impermeable, single-use, waterproof mat with the absorbent side up.
- Use appropriate personal protective equipment (PPE).

7.4 Risks during drug administration

The risk of spillage during instillation can occur as follows:

- Contamination of the exterior of the system due to spillage during reconstitution within the biological safety cabinet
- Spillage of medication prior to catheter insertion into the bladder
- Spillage around the catheter caused by a bladder spasm
- Potential spillage of medication remaining in the catheter upon removal
- The patient's inability to retain the medication for the prescribed dwell time or experiencing incontinence

7.5 Risks when handling patient waste

All material that has been exposed to medication used in intravesical instillation should be considered contaminated and disposed of in accordance with local and hospital regulations in a container specifically used for chemotherapeutic waste [38].

Single use items include:

- Disposables
- Syringes
- Tubing
- Packaging material
- Catheters
- Cleaning tissues
- Absorbent pads
- Incontinence pads
- Personal protective equipment (PPE)

Reusable items include:

- Linens contaminated with MMC or BCG, or excreta from patients who have received intravesical instillations in the past two days are potential sources of occupational exposure. Linens soiled with blood or other potentially infectious materials, as well as excreta, must also be managed as contaminated material. Linens contaminated with MMC or BCG should be placed in specially marked impervious laundry bags. Contaminated laundry should be washed separately from other laundry and preferably washed twice (cold and warm), following a two-step washing procedure [26, 38, 39].

- The mattress of the gurney or bed used during the intravesical instillation should be protected from contamination using protective absorbent pads [40].

7.6 Risks during transportation

During transportation, drug contamination might occur due to damage to the vial/container or contamination of the exterior of the package after preparation. During transportation, the handling personnel must be aware of the content and the risks involved. In accordance with local regulation, a sign/label can be used. Special signage should be used to alert those present in the same room in which hazardous drugs are stored or used [26, 40].

7.7 Cleaning and management of spillages

Periodic cleaning of work surfaces and areas with appropriate deactivation agents according to local guidelines before and after each patient encounter should be part of the established practice of each clinic/hospital.

Deactivation agents are listed on the Material Safety Data Sheet for each manufacturer [41].

Clean-up of small spills

Safety procedures should be in place in any area involved with handling hazardous drugs. Small spills are considered to be < 5ml.

- Spills < 5ml or < 5g outside a biological safety cabinet must be cleaned up immediately by personnel wearing gowns, double latex gloves and splash goggles. If latex gloves are against national regulations or in cases in which the healthcare worker and/or patient has allergies, chemotherapy nitrile/neoprene single gloves should be used.
- Liquids should be removed with absorbent gauze pads and solids should be wiped with wet absorbent gauze. The spill areas should then be cleaned three times using a detergent solution followed by clean water.
- Any broken glass fragments should be picked up using a small scoop (never by hand) and placed in a sharps container. The container should then be placed in a hazardous drugs disposal bin, along with used absorbent pads and any other contaminated waste.
- Contaminated reusable items, such as glassware and scoops, should be treated as outlined previously in the subsection on reusable items [26].

Clean-up of large spills

Safety procedures should also be in place for large spills, which are > 5ml.

- Large spill areas should be isolated, avoiding aerosolisation of the drug.

- Spills should be handled by personnel properly trained in the handling of hazardous material.
- Cover liquid spills with an absorbent pad/sheet.
- Protective apparel, including respirators, should be used as with small spills when there is any suspicion of airborne powder or that an aerosol has been or will be generated.

All contaminated surfaces should be thoroughly cleaned three times with detergent and water. All contaminated absorbent sheets and other materials should be place in a disposal bag for hazardous drugs [26].

8. Healthcare worker and patient safety

8.1 Healthcare worker safety

Risk prevention strategies are mandatory and should start by using instillation methods that minimise risk of contamination. The lowest risk in complexity, and in number of aseptic manipulations, is by making use of pre-mixed compounded sterile preparations [42]. The use of totally enclosed systems where practicable, carries the lowest risk for healthcare workers and patients [26, 43]. Important risk prevention strategies include:

- If enclosed systems are not available, we recommend that you outsource the reconstitution of the medication and the preparation of its administration device to a department that has a biological safety cabinet.
- Closed administration systems are available to connect syringes or bags containing the medication to the catheter, with and without Luer lock tips.
- Both intermittent and indwelling catheters can be used. In the case of a catheter without a Luer lock, an adaptor can be used to connect the catheter to the administration system.
- Ready-to-use closed systems are currently available for both MMC and BCG. Reconstitution of the dose can be carried out on-site, reducing the number of people exposed to the medication. While the risk of exposure is minimized, it does not fully eliminate the risk.
- Prior to the instillation procedure, the healthcare worker must assess the situation for potential risks of spillage and contamination for themselves or others. Depending on the situation, they will need to develop strategies to prevent this from happening.
- Assess whether the patient has signs of bladder spasm (for example, does the patient have a sudden urge to empty their bladder or episodes of incontinence?). If present, consider prescribing anticholinergic medication. In addition, if previous attempts have shown that a bladder spasm may occur, consider using an indwelling catheter with an inflated balloon instead of an intermittent catheter and ensure reduced fluid intake prior to treatment.
- Folding an absorbent pad around the catheter and the entire administration system before removing the catheter will considerably reduce the risk of skin exposure and contamination of the environment.
- To empty the catheter, connect a syringe with 5 ml of saline. 3 ml is sufficient to clear the system of medication.
- When the catheter is removed, the male patient may be recommended to use a condom catheter/external catheter or an incontinence pad in case of episodes of incontinence or to reduce contamination.

8.1.1 Guidance on preparation and handling for healthcare workers

The following table provides information on best practices for preparation and handling of BCG and MMC to ensure healthcare worker safety.

Table 4. Intravesical administration for chemotherapeutic and immunotherapies for healthcare workers

Universal precautions	Follow universal handwashing practices, including proper handwashing before and after contact with the drug/agent, patient's waste, linens and equipment, the environment and before and after any glove use.
Catheterisation technique	Aseptic and atraumatic technique is required when performing urethral catheterisation.
Personal protective equipment (PPE)	**Gloves:** • Long-cuff, heavy-duty, chemotherapy-approved gloves that cover the gown cuff are recommended for use with hazardous drugs. Gloves with little or no powder are preferred, because the powder can absorb contaminating substances [26]. Nitrile or natural rubber latex gloves (where in use) are preferred. For extended exposure to chemotherapeutic drugs, double gloving, using thicker gloves and frequent glove changes increases the protection they afford [44]. **Gown:** • Protective disposable gowns made of lint-free, low-permeability fabric, with a closed front, long / short sleeves according to local guidelines and elastic or knitted closed cuffs should be worn. The cuffs should be tucked under the gloves. If double gloves are worn, the outer glove should be over the gown cuff and the inner glove should be under the gown cuff. When the gown is removed, the inner gloves should be removed last. Gowns and gloves in use in MMC or BCG preparation areas must not be worn outside those areas [26]. **Eye and face protection:** • A surgical mask with eye shield or protective eye gear. Whenever splashes, sprays or aerosols of hazardous drugs are generated that can result in eye, nose or mouth contamination, chemical-barrier face and eye protection must be worn. Eyeglasses with temporary side shields are inadequate protection. Eyewash facilities should also be available.

Spill kit	Ensure a chemotherapy spill kit is readily available. Contents may contain: • Absorbent plastic-backed sheets or spill pads • Disposable chemotherapy-resistant gowns (with back closure) • Chemical-resistant shoe covers • Two pairs of nitrile gloves • Chemical splash goggles • Large, heavy-duty, sealable hazardous drug waste disposal bag • Hazardous waste label (if bags are not labelled)
Eyewash station	Gentle flow of water for 15 minutes after splash exposure.
Waste container	Biohazardous or chemotherapy waste containers readily available.
Disposal	All equipment and material that has been in contact with BCG or MMC must be disposed of as biohazardous.
BCG preparation and cross-contamination prevention	To prevent cross-contamination, no other parental drugs should be prepared in the same area as BCG until the area has been properly decontaminated with the appropriate cleaner.

Adapted from American Urological Association. (2020). Intravesical administration of therapeutic medication. American Urological Association.
Retrieved 4 March 2025 from https://www.auanet.org/about-us/aua-statements/intravesical-administration-of-therapeutic-medication

8.1.2 Pregnant healthcare workers and workers receiving immunotherapy or chemotherapy

Reproductive effects associated with occupational exposure to antineoplastic agents are well-documented. Several studies of nurses found a significantly high proportion of adverse pregnancy outcomes when exposure to antineoplastic agents occurred during pregnancy. The nurses involved in these studies usually prepared and administered the drugs [26].

When administering MMC instillation, pregnant or lactating workers, or those receiving immunotherapy or chemotherapy are advised against not to do the following:
- prepare antineoplastic agents
- perform intravesical instillations
- clean up after spills
- handle cytotoxic waste
- care for patients experiencing heavy perspiration
- handle patient waste

Pregnant or lactating workers are permitted to care for patients being treated with antineoplastic agents if they do not come in contact with urine, stools or vomit. They can also change linens if no visible contamination is seen [32].

8.2 Patient safety

8.2.1 Care instructions for BCG and MMC

8.2.1.a Skin contact

Intravesical agents must not be allowed to come in contact with the patient's skin. If this does happen with MMC, the skin should be cleaned with water and soap. Contact with the eyes should also be treated with prolonged flushing with water (15 minutes). A physician should also always be notified. The same procedures apply to contact with BCG, and washing with soap and water is sufficient. Handwashing and rinsing of the perineum is advised after passing urine.

8.2.1.b Toileting

Toilets are where the risk of contamination after preparation and administration of chemotherapeutic agents are highest [43]. High urinary urgency and incontinence are additional reasons for toilet contamination after intravesical instillation. In some countries, it is advised to flush the toilet twice with the lid closed, however, there is no evidence to support this precaution. Family members who handle contaminated excreta should wear gloves. If a private bathroom is not available for the patient in the home setting, one suggestion is that hazardous drug residue may be physically removed from the toilet seat and rim after use by wiping down with a sanitizing wipe [45]. More research is needed on how well sanitizing wipes in the home setting and routine cleaning in the institutional setting reduce surface contamination with hazardous drugs.

8.2.1.c Contamination of clothes

Normal washing of clothes is safe for dealing with MMC and BCG contamination (see Section 7.5) [40, 46]. For further information on side effects, resuming normal activities, voiding and medication, see Chapter 11.

8.2.2 Pregnant patients

Pregnancy within six months after the therapy is not advised. Breast feeding during therapy with MMC or BCG is also contraindicated [17, 18, 47].

8.2.3 Fertility

Patients treated with BCG or MMC can show marked changes in sperm quality [48, 49]. Intravesical therapy with BCG has been shown to significantly decrease total sperm concentration, as well as sperm motility, which can affect fertility. Patients should be informed of this potential effect and advised to preserve sperm to avoid future fertility issues [49].

Patients treated with BCG or MMC are advised to use protective contraception (e.g. condoms) during sexual intercourse or to refrain from intercourse for one week after treatment, because excreta can remain in the body of patients undergoing BCG therapy [18].

Recommendations	LE	GR
Assess the risk of handling antineoplastic and biological drugs and take suitable precautions to protect employees by identifying the hazards and deciding who might be harmed and how.	4	C
Follow local and hospital safety procedures to prevent exposure of patients and personnel to hazardous medication.	4	C
Prepare instillation medication in a pharmacy or use biological safety cabinet when a closed system is not used, to prevent exposure.	4	C
Use a closed system to reduce risk of exposure during drug administration	3	B
To reduce the risk of exposure during drug preparation and administration, personal protective clothing should be worn in accordance with local and hospital safety procedures.	3	B
All material that has been exposed to medication used in intravesical instillation should be considered contaminated and disposed of in accordance with local and hospital regulations and in a container specifically used for chemotherapeutic waste.	4	C
Protect reusable materials and furniture at risk of being contaminated during the intravesical instillation by protective absorbent pads.	4	C
All personnel involved in handling, transporting and cleaning materials used for intravesical instillations must be properly trained on the content and the risks involved.	4	C
Nurses should educate patients and caregivers on how to deal with the risk of exposure during and after the intravesical instillation.	4	C
Nurses should advise patients not to become pregnant within six months after treatment with BCG or MMC.	4	C
Pregnant or lactating healthcare workers caring for patients being treated with antineoplastic agents (MMC) should follow local guidelines when preparing or administering the drugs and cleaning spillages or waste. These workers should not come in contact with the patient's urine, stools, vomit or heavy perspiration.	4	C

9. Nurse education prior to intravesical instillation

To ensure patient and nurse safety, it is essential that all nurses administering the treatment meet specific prerequisites, maintaining a universal standard of education, understanding and competence. The nurse specialist administering intravesical treatment must be trained and assessed by a competent practitioner in accordance with local guidelines. It is also important that the nurse specialist keep their intravesical-treatment skills up to date to ensure continued competence, with a prerequisite that they be deemed competent in urethral catheterisation (Table 5) [50].

To ensure compliance with current safety regulations, all staff involved in handling MMC or BCG (including physicians, nurses and employees involved in receiving, transporting or storing these agents) must receive comprehensive information and training regarding the associated hazards. This training should be provided at the start of their assignment to areas in which the drugs are present. The employer should provide annual refresher information and training, which is essential to maintain awareness and adherence to safe handling practices [25, 26].

The initiation of intravesical treatment should be determined by the urological surgeon or through the multidisciplinary team meeting. In countries in which specialist nurses are licensed to prescribe medication, it continues to be good practice to make this decision in consultation with the urologist and multidisciplinary team.

Table 5. Nurse education for bladder instillation

Maintain knowledge/skill in:	Rationale
Bladder cancer pathway	To ensure treatment plans and further investigations take place as required
Indication for treatment	• To ensure the patient meets clinical criteria for specific treatments • To ensure the treatment offers potential benefits for the patient • To help the patient understand the benefits of treatment for their disease
Data supporting use of treatment	To help patients understand the benefits of treatment where necessary, as some patients may not want this information

Importance of counselling the patient regarding the treatment	To help ensure patient preference, promote compliance and build trust and confidence, enabling the patient to take an active role in their care
Pharmacokinetics and pharmacodynamics of the agent being used	All nurses have a responsibility to understand medication they administer to patients to help the patient understand how the treatment works and how it affects their disease.
Contraindications of treatments	To ensure patient safety by avoiding treatments that could cause harm or adverse reactions
The physical and health hazards of MMC and BCG in the work area and the measures employees can take to protect themselves from these hazards.	• To maintain patient safety • To maintain nurse safety • To maintain safety of others and the environment
Management of spillages and waste disposal	• To maintain patient and nurse safety • To maintain safety of others/environment and use spill kits specifically designed for cytotoxic and biohazard agents
Anatomy and physiology of the urinary tract	An understanding of the urinary tract anatomy and physiology ensures safe, effective care and management of urinary conditions and treatment
Competent in urethral catheterisation	To ensure patient-centred care while maintaining safe and effective administration of the treatment and reducing risk of side effects.
Side effects of the agent being used	• To help patients manage and understand side effects • To help improve engagement and compliance • To identify side effects that require further management • To counsel the patient effectively, maintaining safe practice and outcomes
Dose/schedule	To ensure the treatment is administered according to the summary of product characteristics (SmPC).
Personal protective equipment to be used when performing intravesical instillation	• To maintain nurse safety using appropriate PPE • To maintain safety of others/environment
The carcinogenic potential and reproductive hazards of these drugs	To understand the importance of avoiding drug exposure, especially early in pregnancy, ensures informed decision making about the hazards involved

9.1 Recordkeeping

The competent practitioner who educates the nurse should prepare training records, including the following information:

- Dates of the training sessions
- Contents or a summary of the training sessions
- Names and qualifications of the persons conducting the training
- Names and job titles of all persons attending the training sessions

Training records should be maintained for three years from the date on which the training was held [26].

Recommendations	LE	GR
All staff involved must receive training on handling hazardous drugs.	4	C
Intravesical therapies must be administered by a trained nurse and assessed by a competent practitioner.	4	C
The decision to initiate intravesical therapies must be made by a multidisciplinary team.	4	C
Training records must be maintained.	4	C

10. Preparation and administration of intravesical therapy

Before starting the intravesical instillation, some general aspects should be considered. In this chapter, we describe aspects related to patients, medication used and administration procedures.

10.1 Patient assessment

Prior to initial and subsequent administration of intravesical therapy, the patient should be assessed before and after all instillations with regard to the following:

- Overall health status
- Specific urological health status
- Ability to understand the procedure
- Ability to comply with the treatment plan
- Understanding treatment side effects and potential complications

Recommendations	LE	GR
Confer with urologist if symptoms of local or systemic UTI.	4	C
Do not use dipstick to rule out UTI [20].	3	B

10.2 Pre-procedure

Assessing the patient prior to commencing each intravesical therapy aims to:

- Highlight any potential risks or complications from treatment.
- Identify any individual patient requirements that may affect compliance, concordance and efficacy of treatment.
- Help manage patient expectations.
- Highlight any aspects requiring specialist referral or further assessment.

Table 6 presents the most common problems during patient assessment. A common tool for undertaking nursing assessment is using a model of nursing care such as the Roper, Logan and Tierney Activities of Daily Living model of nursing assessment [51]. This assessment is undertaken at the outset of treatment and highlights the normal situation for patients and identifies the changes that occur during their illness.

Table 6. Common problems identified during assessment and nursing interventions

Maintaining a safe environment	
Finding	**Nursing interventions**
Inability to mobilise to/from toilet	Consider indwelling catheter with clamp/valve for the duration of the dwell time.
Neurological impairment	Consider keeping patient in clinic for the duration of the dwell time.
History of traumatic/difficult catheterisation causing urethral bleeding	Catheterise with extra care or use more lubricant than usual or consider an alternative catheter or more experienced personnel.
Communication	
Finding	**Nursing interventions**
Inability to understand rationale for treatment	Provide an explanation and written information to carers/families/interpreters where appropriate.
Memory or mental health problems	Ensure that a carer is available or keep the patient in hospital/clinic for the duration of the dwell time.
Inability to understand the importance of holding urine for dwell time	Consider indwelling urethral catheterisation with clamp/valve for the duration of the dwell time.
Eating, drinking and smoking	
Finding	**Nursing interventions**
The role of nutrition; vegetables	Inform that increasing consumption of raw cruciferous vegetables (75 g) could be a strategy to provide further protection against risk of recurrence, particularly those who receive BCG. [52].
Patient unable/unwilling to restrict fluid intake prior to instillation	Advise the patient that restricting fluid intake may help to maintain intravesical therapy for the desired time and prevent over dilution of the drug during dwell time [53].
Patient unwilling to drink excess fluid after the dwell time	Advise the patient that increased fluid intake after the dwell time may help eliminate intravesical therapy agents from the bladder and reduce the risk of side effects.
Patient is a current smoker	Inform the patient that smoking reduce the efficacy of BCG immunotherapy [54, 55].

Elimination	
Finding	**Nursing interventions**
Lower urinary tract symptoms (LUTS)	Assess LUTS in women with the ICIQ FLUTS score and in men with the International Prostate Symptom Score (IPSS).
Storage symptoms	Consider management of storage symptoms that are likely to worsen during treatment (e.g. anticholinergics or containment products) [56].
Obstructive symptoms (affecting elimination of intravesical therapy)	Consider postmicturition bladder scan to ensure intravesical therapy agents are eliminated from the bladder. In patients with residual urine, consider α blockers, 5α-reductase inhibitors, intermittent self-catheterisation and surgical management.
Signs/symptoms of UTI	Send urine for culture and withhold treatment.
Urinary incontinence	Consider containment products or indwelling urethral catheterisation for the duration of the dwell time.
Controlling body temperature	
Finding	**Nursing interventions**
High fever (> 38.5°C)	Discuss this with the doctor and consider interruption of treatment – treatment not to be administered.

10.3 Informed consent

Depending on local regulations, some centres may require patients to sign a consent form, whereas others may accept verbal consent. Before administering treatment, it is important that the nurse be confident that the patient has been informed regarding the benefits and risks of intravesical instillation.

10.4 Preparation of bladder instillation medication

Bacillus Calmette-Guérin should not be prepared in areas in which intravenous drugs are prepared, because nosocomial infections have been reported in patients receiving parenteral drugs that were prepared in areas in which BCG was prepared [57].

Procedure

Follow the directions on the manufacturer's package insert (SmPC) for proper preparation of MMC and BCG.

Dosage

The dosage range for MMC is 20–60mg. The most frequent dose is 40mg. The dosage of BCG is based on the number of colony forming units (CFUs), which depends on the specific BCG strain and varies between 1 to 8 x 10^8 and 10^9 CFUs. In clinical practice, milligram dosages are often used (range 40-120mg, depending on the strain) [58].

10.4.1 Medication pre-procedure

If the patient has pre-existing storage symptoms, anticholinergics may be effective [59]. Caution must be used in patients with conditions that could be aggravated by this medication, such as angle-closure glaucoma, benign prostatic hyperplasia and cardiac disease. If anticholinergics are ineffective or contraindicated, β agonists may be used. A study found no benefit in using oxybutynin routinely as prophylaxis against urinary symptoms during BCG therapy [60]. If concerns persist regarding incomplete emptying, the patient should be counselled to keep the catheter in for the duration of treatment.

10.4.1.a Analgesics

There is no contraindication for non-steroidal anti-inflammatory agents.

10.4.1.b Antibiotics

There is no evidence that concurrent use of antibiotics decreases the efficacy of BCG or MMC, but if a patient is being treated with antibiotics, starting bladder instillation should be discussed with the prescribing physician.

10.4.1.c Diuretics

When patients are prescribed diuretics as part of their regular medication, the need to refrain from taking prescribed diuretics must be verified with the patients' urologist, because this is a patient-specific issue. Instruct the patient to minimise fluid intake in the 3 to 4 hours before treatment to minimise urine production during treatment [61]. This may also help improve the patient's ability to retain the instilled medication for the prescribed dwell time.

10.5 Administration of intravesical instillation

10.5.1 Positioning of the patient

The structure of an empty bladder allows the bladder wall to directly interact with the intravesical medication and, therefore, patients should be encouraged to remain as mobile as usual. Some hospitals request patients to rotate from side to side every 15 minutes (the 'rotisserie' method) to improve drug contact with bladder mucosa [38, 62]. However, It has been demonstrated that there is no difference in recurrence rates between the rotisserie and non-rotisserie methods during treatment with BCG

[63]. This reinforces the idea that contact with the bladder wall is sufficient for the medication to be effective.

For practical reasons, the catheter should be inserted while the patient is in the supine position. If there is no risk of incontinence, no further mobility restrictions are necessary. Mobility is encouraged over bed rest.

10.5.2 Cleaning of the meatus

Routine daily personal hygiene is all that is needed to maintain meatal hygiene [64-68]. Trials of various cleaning agents, such as chlorhexidine and saline, have failed to reduce bacterial growth rate, therefore, soap and water is sufficient to achieve effective meatal cleaning [11, 68, 69].

10.5.3 Instillation equipment

Chapter 7 discusses the importance of safe handling of both BCG and MMC. Because a closed system is highly recommended, nurses are advised to use ready-to-use kits. Currently, ready-to-use packages are available that contain a closed system transfer device intended solely for intravesical instillations. These kits can be prepared without the need for a biological safety cabinet, thus simplifying the logistics of the procedure. The kits can also be stored on the ward where the instillation takes place.

If ready-to-use medication is not available in the area, it must be prepared in advance. Check the Summary of Product Characteristics (SmPC) for information on stability and how long the medication remains viable after reconstitution.

In this case, it is mandatory to either have access to a biological safety cabinet or use a closed system to reconstitute the medication. Such systems are airtight, leakage-resistant and utilise membrane technology. If the above-mentioned systems are unavailable, it is recommended to prepare the medication in a pharmacy department equipped with a biological safety cabinet.

10.5.4 Catheter type and size

Where possible an intermittent catheter should be used. Some considerations for the choice of catheter for the intravesical instillation include:

- The smallest size possible, such as CH10, or CH12 should be used to prevent causing pressure and injuring urethral tissue [68], as well as to prevent excessively rapid instillation.
- Hydrophilic or prelubricated catheters decrease the risk of discomfort, trauma and post-catheterisation infection [70-72].

- Luer lock catheters (Figure 1) reduce the risk of spillage by maintaining a closed system. Some intermittent catheters have the luer lock end integrated, whereas indwelling catheters require an adaptor attached prior to the instillation procedure. Some of the MMC and BCG products in 'ready-to-use packaging' are equipped with the luer lock system.
- The first choice for instillation is an intermittent catheter. An indwelling catheter should only be placed when there is a clear indication. The indwelling catheter should not stay in place any longer than necessary [68].

10.5.5 Lubricant

For non-hydrophilic catheters, 10–15ml of lubricant with lidocaine should be used [68, 73].

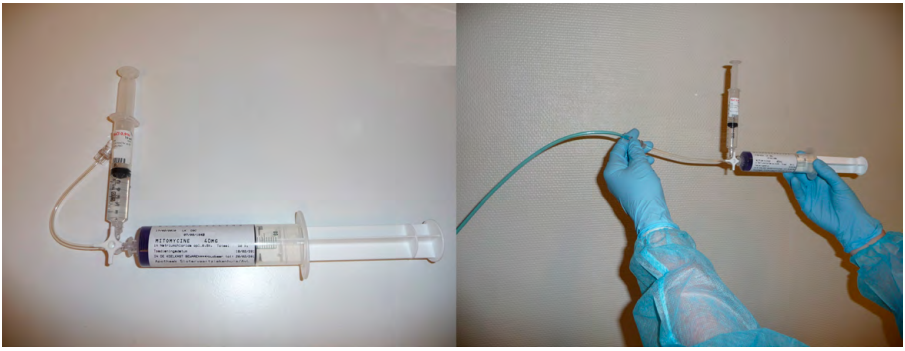

Figure 1: Luer-lock catheter and syringe with MMC

10.6 Recommendations for the preparation and administration of intravesical therapy

Recommendations	LE	GR
Do not prepare BCG in areas in which intravenous drugs are prepared.	3	B
Use an intermittent catheter with the smallest size possible, such as CH10, for intravesical instillations.	4	C
Use a luer lock catheter to reduce risk of exposure for intravesical instillations.	4	C
Choose a hydrophilic catheter to reduce risk of discomfort, trauma and infection.	3	B
Use 10-15ml of lubricant when a non-hydrophilic catheter is used.	2a	B

10.7 Ability of the bladder to hold medication

There is no evidence to support the possibility that reduced bladder capacity decreases the effectiveness of intravesical therapy. The total volume of either drug solution is < 60 ml and should be tolerated by any bladder capacity. Factors that may assist patients with reduced bladder capacity to retain these medications for the prescribed dwell time include:

- Minimising the volume of the drug solution to be instilled to increase the concentration in the urine and, therefore, facilitate diffusion across the urinary mucosa [59].
- Treating with anticholinergics.

10.8 Post-operative administration of MMC

The most favourable time for postoperative instillation of MMC is within six hours after TURBT. The rationale for immediate postoperative instillation is:

- Prevention of implantation of circulating tumour cells in the bladder.
- Chemoresection of any residual tumour cells [14].

In a meta-analysis of 18 RCTs (with 3,103 patients), 37% of patients receiving a single dose of MMC chemotherapy immediately after TURBT experienced recurrence, as compared to 50% of those who had undergone TURBT alone [12]. This means that seven patients must be treated to avoid one recurrence. Some authors consider this number an underestimation [11].

10.9 Dwell time

Efficacy of intravesical MMC chemotherapy is relative to the duration of exposure and drug concentration at the tumour site. Dilution of the MMC solution by urine production occurs within five minutes of instillation [74]. Although dwell time is still subject to debate, recurrence rates are lower with an increase in dwell time from 30 to 60 minutes [75]. Systemic drug absorption is not affected by extended exposure to MMC. The dwell time in reported studies were one hour in (range: 25–120 minutes. Although recent RCTs have failed to show significant benefit of a single postoperative instillation, the above-mentioned meta-analysis reported a pooled relative risk of recurrence of 0.67 (95% confidence interval: 0.56–0.79) [12]. If a T1, TIS or Ta high-grade tumour is suspected, the benefit of immediate instillation is not supported by consistent evidence and remains merely an option [76]. In another study administration of the first postoperative instillation later than on Day 0 was associated with > twofold relative risk of recurrence in multivariate analysis [77].

The dwell time that is commonly practised is one hour for Mitomycin and up to two hours for BCG, respectively. Longer periods are not recommended due to dilution of the drug concentration over time as urine is transported into the bladder.

10.10 Patient education

The purpose of education is to empower patients and caregivers, giving them more control and enhancing their ability to solve problems related to intravesical instillation. A key role of nursing is patient education, and many of the nursing interventions described in the study by Wang et al., are related to this role [78]. Both patient education and psychosocial interventions can positively influence the outcome of bladder cancer therapy.

Before beginning any intravesical therapy, patients must be informed about the mechanism of action of their treatment and any potential side effects. Information on scheduling and post-procedural follow-up should also be included. Education should be tailored to both patients and caregivers. The communication skills and attitudes of healthcare professionals play a crucial role in fostering confidence in completing the procedure and encouraging long-term adherence to the treatment plan.

Who: Healthcare professionals need to communicate the procedure to the patient. When patients are discharged, caregivers and those living with the patients require instructions on the precautions needed at home.

When: To decrease anxiety about the treatment, it is important to instruct patients about the necessary steps of the procedure that they are about to undergo. Upon discharge, patients need to know where and when to void, including proper handling of any spilled urine. After discharge, it is important that patients receive counselling regarding signs of local and systemic skin reactions and be instructed to notify their physicians if any of these unforeseen changes occur [78, 79].

Where: Instruction should take place in the clinic prior to any treatment.

How: The educator should make an assessment of the most effective instruction method for each individual patient (i.e. verbal instruction, booklets or digital information). All verbal information should be reinforced with written information that the patients and caregivers can keep and consult.

What: The following topics should be discussed:

- Medications to avoid/delay prior to instillation:
    - Antibiotics
    - Diuretics

- Fluid intake management:
    - Prior to each treatment, fluids should be restricted to maximise the concentration of the drug in contact with the bladder wall. Patients should refrain from fluid intake for eight hours prior to instillation [80]. This minimises urine production during therapy and increases the ability of patients to retain the agent for the prescribed dwell time; usually two hours.
    - Upon treatment completion on any day, patients should be instructed to increase fluid intake to flush out any remaining agent from the bladder.

- Voiding post-procedure:
    - Upon completion of the prescribed dwell time, patients should void directly into the toilet, and male patients should sit when voiding. This helps limit splashing and contact of surfaces with residual agents.
    - After each void, the toilet should be flushed with the lid in the closed position, if available.
    - It is common practice in some countries to advise patients undergoing BCG therapy that 250ml of bleach/hypochlorite should be poured into the toilet and remain there for 15 minutes before flushing. However, no evidence has been found to support this recommendation.
    - In the case of MMC therapy, due to the possibility of contact dermatitis, patients should be instructed to wash their genitalia after voiding [39].

- The most common side effects associated with BCG and MMC (see Chapter 11).
- Urinary tract irritation is a common reaction to all agents. This may be due to chemical cystitis and not a bacterial infection. Patients should be informed of the signs and symptoms of UTI.
- Launder any clothing that may be contaminated with these agents, through spillage or incontinence, separately from other clothing (see Section 7.5).
- Instruct patients that they may resume normal activity, including health maintenance, diet and exercise for a healthy lifestyle.
- Instruct patients who are sexually active to use barrier/protective mechanisms during intercourse (i.e. condoms) or to abstain from intercourse for one week after treatment.
- Counsel smokers to stop smoking [54].
- Alcohol should be avoided due to its diuretic effect.

For easy reference, these guidelines include a checklist that is intended to assist healthcare professionals to check whether all the information that must be given to the patients has been provided. The checklist for patient information can be found in Appendix 2 - Checklist for patient information.

Recommendations	LE	GR
Counsel smokers to stop smoking.	2a	A
Inform patients and caregivers regarding the therapy, fluid intake, safety precautions that should be taken, and any side effects that may occur.	4	C
Assess the most effective learning method for each individual patient.	4	C

11. Complications and side effects

11.1 Catheter associated bacteriuria

Insertion of a catheter outside an operating theatre is a risk factor for developing bacteriuria [19]. Aseptic technique must be used when inserting the catheter before instillation. To minimise the risk of cross-infection, healthcare professionals must be constantly aware of their hand hygiene [50].

Recommendations	LE	GR
Use aseptic technique when inserting the catheter before intravesical instillation.	3	B
Be constantly aware of hand hygiene and observe protocols on hand hygiene.	1b	A

11.2 Side effects of MMC

The high molecular weight of MMC results in low absorption, therefore, it does not usually cause systemic toxicity. Local toxicity, however, is more common, resulting in chemical cystitis, allergic rash and palmar or genital desquamation from contact dermatitis [62].

11.2.1 Local side effects: chemical cystitis

Administration of cytotoxic chemotherapy into the bladder can induce an array of irritative voiding symptoms. Most of the adverse effects occur during the first six months of therapy [81]. These side effects can be treated symptomatically:

- dysuria
- frequency
- urgency
- suprapubic discomfort
- gross haematuria
- pelvic pain

These symptoms are referred to collectively as 'chemical cystitis' [79, 82-87]. The incidence of chemical cystitis is ~10%, and the prevalence of symptoms is 1-25% [79].

Other severe local side effects of intravesical chemotherapy [79, 83, 84, 88, 89] include transmural and extravesical fat necrosis and bladder wall ulceration and calcification.

11.2.2 Systemic side effects

Intravesical chemotherapy can cause skin toxicity, both through direct contact and systemic exposure following absorption through the bladder epithelium. An estimated 9% of patients develop some type of cutaneous side effect. Common manifestations of skin reactions include a generalised rash, along with dermatitis of the hands and feet or genitalia. Other reported symptoms include eruptions of the face, trunk or chest; vulvar dermatitis; and palpable purpura of the lower extremities [79, 83, 85, 90, 91].

11.2.3 Long-term complications

Benign chronic ulcers at the resection site have been described and are attributed to the effect of impaired healing from chemotherapy. Calcification, fibrosis, reduced bladder volume and reduced bladder compliance are less common [79, 83, 86, 87, 92, 93].

11.2.4 How to reduce the risk of side effects of MMC

Minimise systemic absorption: one of the first factors to be considered is the risk of drug absorption, which may result in systemic toxicity. Although some factors that affect drug absorption may be under the control of the operating surgeon (such as surgical technique and depth of resection), others are strictly related to the physical properties of the drug. Such properties include molecular weight, concentration and liphophilicity. Other factors that may increase absorption include drug dwell time and bladder wall integrity [79].

Reduce discomfort during instillation: other strategies to help reduce discomfort during treatment include ensuring that the bladder is empty before drug instillation and ensuring meticulous haemostasis at the end of resection to prevent accumulation of blood clots that may occlude the catheter and exacerbate the symptoms [79]. A novel technique has been proposed to improve patient comfort during intravesical instillation of MMC. Some of the pain associated with perioperative instillation results from the rigid resistance of a clamped catheter, and it is proposed to maintain the chemotherapeutic agent in the bladder without clamping. By elevating the urine bag 1m above the supine patient, MMC can be retained in the bladder by hydrostatic pressure [79, 94].

Prevent necrosis and ulceration: the most important method to reduce the incidence of necrosis and ulceration is to establish haemostasis after tumour resection and perform intraoperative cystography if there is any suspicion of bladder injury [79].

11.2.5 How to manage side effects of MMC

Intraperitoneal extravasation: initial management comprises immediate evacuation of the drug, followed by confirmation by cystography. Exploratory laparotomy is required to confirm evacuation of the drug and repair of the defect [79, 95].

Extraperitoneal extravasation: management involves catheter drainage, but it is also essential to carry out imaging to evaluate fluid collection, abscess formation, fistula formation or bowel obstruction. Fluid collections should be drained, and culture-directed antibiotics should be initiated [79, 95].

Chemical cystitis: symptoms are usually self-limiting and require no further treatment in the perioperative setting. Agents such as phenazopyridine and anticholinergics can be used in difficult cases. Powdered opium and belladonna alkaloid suppositories can also be used during instillation to provide relief of bladder spams and discomfort, and to help with retention of the intravesical agent [79].

Skin toxicity: It is important to differentiate between local skin toxicity and systemic allergic or hypersensitivity reactions, as management and the need for medical review may differ. In most cases, cutaneous side effects resolve after removal of the causative agent. Antihistamines and corticosteroids are useful for those who develop generalised urticaria [79, 90].

Myelosuppression: management is usually supportive. Blood products can be given in severe cases of myelosuppression, but the incidence of severe myelosuppression is low [79].

Table 7. Side effects of MCC and their recommended nursing interventions [79, 90, 95]

MMC – local	Nursing interventions
Chemical cystitis	• Treat these side effects symptomatically. • Agents such as phenazopyridine and anticholinergics can be used in more bothersome cases.
MMC – systemic	**Nursing interventions**
Skin toxicity	• Remove exposing agent. • Use antihistamines and corticosteroid.
Myelosuppression	• Blood products can be given in severe cases.

Intraperitoneal extravasation	• Call the doctor for immediate evacuation of the agent, followed by cystography.
Extraperitoneal extravasation	• Fluid collections should be drained with a catheter. • Initiate antibiotic prophylaxis. • Extensive extravasation, ongoing leak, or suspected intraperitoneal involvement requires surgical exploration and repair.

11.3 Common side effects of BCG

Intravesical BCG is associated with more side effects compared to intravesical chemotherapy [14]. The most common side effects of BCG treatment are increased urinary frequency, dysuria, urgency and flu-like symptoms. These effects are reported in > 90% of patients receiving therapy [96]. In four of five studies with toxicity data, BCG-associated cystitis was significantly more frequent than MMC-associated cystitis (53.8% versus 39.2%) [97]. In a study by EORTC, 20% of patients treated for three years with BCG stopped treatment due to local or systemic side effects [98]. However, serious side effects are encountered in < 5% of patients and can be treated effectively in almost all cases [14]. Maintenance therapy is not associated with an increased risk of side effects compared with induction [14]. Major complications can appear after systemic absorption of BCG. Contraindications to intravesical instillation of BCG should therefore be respected [14]. The most common side effects of BCG and their management strategies are presented in Table 8, which is reproduced with permission from the EAU Guidelines on Non-Muscle-Invasive Bladder Cancer [14]. Table 9 presents rare local and systemic side effects.

Table 8. Management options for side effects associated with intravesical BCG [99-102]

Local side effects	Management options (modified from International Bladder Cancer Group)
Frequency, urgency or dysuria	Phenazopyridine, propantheline bromide or non-steroidal anti-inflammatory drugs (NSAIDs)
	If symptoms improve within a few days: continue instillations.
	If symptoms persist or worsen: a. Postpone the instillation. b. Perform a urine culture. c. Start empirical antibiotic treatment.

Frequency, urgency or dysuria	If symptoms persist even with antibiotic treatment: a. With positive culture: adjust antibiotic treatment according to sensitivity. b. With negative culture: quinolones* and potentially analgesic anti-inflammatory instillations once daily for 5 days (repeat cycle if necessary) [100].
	If symptoms persist: antituberculous drugs + corticosteroids.
	If there is no response to treatment and/or contracted bladder: radical cystectomy.
Haematuria	Perform a urine culture to exclude haemorrhagic cystitis if other symptoms are present.
	If haematuria persists, perform a cystoscopy to evaluate the presence of a bladder tumour.
Symptomatic granulomatous prostatitis	Symptoms rarely present: perform a urine culture.
	Quinolones.
	If quinolones are not effective: treat with isoniazid (300 mg/day) and rifampicin (600 mg/day) for 3 months.
	Cease intravesical therapy.
Epididymo-orchitis [101]	Perform urine culture and administer quinolones.
	Cease intravesical therapy.
	Perform an orchidectomy if abscess occur or if there is no response to treatment.
Systemic side effects	**Management options**
General malaise, fever	Generally, resolves within 48 hours, with or without antipyretics.
Arthralgia and/or arthritis	This is a rare complication and is considered an autoimmune reaction.
	Arthralgia: treatment with NSAIDs.
	Reactive arthritis: treat with NSAIDs.
	If there is no/partial response, proceed to corticosteroids, high-dose quinolones or antituberculosis drugs [102].
Persistent high-grade fever (> 38.5°C for > 48h)	Permanently discontinue BCG instillations.
	Perform immediate evaluation: urine culture, blood tests and chest X-ray.
	Treat properly with more than two antimicrobial agents while diagnostic evaluation is conducted.
	Consult an infectious disease specialist.

BCG sepsis	Prevention: initiate BCG at least 2 weeks post-transurethral resection of the bladder (if no signs and symptoms of haematuria).
	Cease BCG.
	For severe infection: • Administer high-dose quinolones or isoniazid, rifampicin, and ethambutol 1.2 g daily for 6 months. • Administer early, high-dose corticosteroids as long as symptoms persist. • Consider an empirical non-specific antibiotic to cover Gram-negative bacteria and/or *Enterococcus*.
Allergic reactions	Administer antihistamines and anti-inflammatory agents.
	Consider high-dose quinolones or isoniazid and rifampicin for persistent symptoms.
	Delay therapy until reactions resolve.

** Persistent severe cystitis symptoms associated with BCG use have a high risk of underlying a complicated UTI (even in the absence of a positive culture) and thus no restriction applies to the empirical use of quinolones by the EMA's Pharmacovigilance Risk Assessment Committee (see also Section 3.7 Complicated UTI and Section 3.7.4.1 Choice of antimicrobials of the EAU Guidelines on Urological Infections 2025 [19, 103].*

Table 9. Rare local and systemic side effects

Rare local side effects	
Penile granuloma [104-106]	Prostatic abscess [107]
Bacteriuria [20]	Contact dermatitis [108-112]
Bladder ulcer and calcifications [110, 111, 113-116]	Ischemic colitis [117]
Contracted bladder [109, 110]	Femoral artery aneurysm [118]
Ureteral obstructions [109, 110, 113, 119]	Ruptured abdominal aortic aneurysm [118]
Urinary incontinence [108]	Pelvic and inguinal abscess [120]
Extravesical granuloma [113]	Granulomatous pyelonephritis [121]
Mycotic abdominal aorta aneurysm with psoas muscle abscess [122]	Caecum angiodysplasia with uncomplicated flat polyp [123]
Renal abscess/mass [109, 124, 125]	Ophthalmic complications [126, 127]
Suprarenal mycotic aortic aneurysm [128-130]	Urinary tract infection [131]

Rare systemic side effects	
Pneumonitis, hepatitis [109]	Acute renal failure, interstitial nephritis [132]
Granulomatous hepatitis and choroiditis [133, 134]	Decrease in the sperm count (oligospermia) [49]
Bilateral cervical lymphadenitis andrioretinitis [135]	Reiter's syndrome (pain, limitation of the cervical spine, synovitis of the right knee) [119, 136]
Vertebral osteomyelitis, epidural abscess, cerebral tuberculoma [137]	Persistent high-grade fever (> 38.5°C for > 2 days) [14, 108, 117, 119, 128, 138]
Headache [108]	BCG spondylitis [130, 139]
Aortoduodenal fistula [133]	Myelosuppression [109, 110]

11.4 How to reduce the risk of side effects of BCG

In two studies, a sequential administration of 40mg of hyaluronic acid reduced local side effects of BCG [140]. Another study suggested the use of Adelmidrol in combination with hyaluronic acid (intravesical instillations with a medical device combining Adelmidrol 2% + hyaluronic acid 0.1%) [141]. Further studies are needed.

The use of intravesical instillations of hyaluronic acid (HA 1.6%) and chondroitin sulfate (CS 2%) may be considered in patients with symptoms of BCG-induced chemical cystitis or at risk of developing it, in order to reduce bladder-related symptoms (e.g., frequency, urgency, pelvic pain) and to improve adherence to BCG therapy. Two clinical studies support this approach: A retrospective observational study [142] showed a sustained improvement in urinary symptoms in patients with BCG-induced chemical cystitis refractory to first-line treatments, after eight weekly instillations of HA + CS, with no adverse events reported. A prospective, multicenter, non-randomised controlled study [143] demonstrated that sequential administration of HA + CS after each BCG instillation during the maintenance phase significantly reduced bladder pain, lower urinary tract symptoms (LUTS), and therapy dropout rates compared to a control group receiving BCG alone. Further randomised controlled trials are warranted to define standardised treatment protocols and assess long-term efficacy and safety.

Three RCTs showed reduced side effects by administering different quinolones in conjunction with the BCG instillations [144-146]. The latter, involving the use of two doses of levofloxacin (at 6 and 12 hours after first voiding) in conjunction with each BCG instillation, reduced the proportion of patients with high-grade side effects, both local (pollakiuria) and systemic (fever), without improving the completion rate of the maintenance regimen or the risk of severe BCG-related adverse events [144].

11.5 How to manage side effects of BCG

Patients should be informed about potential side effects and involved in discussions about symptom management, treatment continuation, and any necessary adjustments to their regimen.

Management of side effects after BCG should reflect their type and grade (Table 8) [110].

No significant differences in toxicity are detected according to dose (one-third dose versus full dose) or duration (1 year versus 3 years) of BCG treatment. Neither reducing the dose nor shortening the duration of maintenance decreased the percentage of patients who stopped treatment because of side effects [147, 148]. One study reported less toxicity in patients who were treated with one-third dose of BCG for three consecutive weeks every six months [148]. The EORTC did not find any difference in toxicity between one-third and full-dose BCG, but one-third dose BCG was associated with a higher recurrence rate, especially when it was given only for one year [98]. To manage and monitor all side-effects, nurses can use the validated questionnaire "Bladder Instillation Therapy Form (BITF)" [149]. *See Appendix 3*.

Recommendations	LE	GR
Assess the patient for side-effects.	4	C
Ensure the bladder is empty before instilling BCG or MMC.	3	C
Consider use of intravesical instillations of hyaluronic acid (HA 1.6%) and chondroitin sulfate (CS 2%) in patients with BCG-induced chemical cystitis [142, 143].	2b	B
Confer with urologist if antibiotics are needed in patients with risk of pollakiuria and fever.	1a	B

12. Patient quality of life (QoL)

12.1 Impact of intravesical instillations on patient reported outcomes (PROMs)

Future QoL is one of the most important questions for cancer patients. However, there are significant gaps in our knowledge and understanding of health-related quality of life (HRQoL) in patients undergoing treatment. Given the rapidly evolving landscape for treatment and management of NMIBC, understanding the burden of treatment and its impact on HRQoL is of paramount importance [150, 151].

Approximately 75% of bladder cancer patients have NMIBC at time of diagnosis, however, only 25% of studies conducted concerned HRQoL in NMIBC patients [152]. Nearly 60% of NMIBC patients have recurrent cancer leading to recommendation for routine repeated surveillance cystoscopies with resection, with or without intravesical chemotherapy or immunotherapy, which is standard of care in patients with intermediate or high-risk NMIBC [14]. Due to the unique burden of invasive surveillance, a better understanding of health status and HRQoL for NMIBC patients is urgently needed [153].

The European Organisation for Research and Treatment of Cancer (EORTC) defines HRQoL as:

> *"a multi-dimensional construct covering at least several key dimensions such as disease and treatment-related symptoms, as well as psychological and social functioning. HRQoL measures the (cancer) patient's interpretation of the impact of a health condition on relevant aspects of their lives"* [154].

In contrast, the World Health Organisation (WHO) defines QoL as:

> *"an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns"* [155].

In other words, HRQoL is the treatment-related, patient-perceived QoL (based on the EORTC definition) and QoL is based on daily life experiences. The term HRQoL was introduced to distinguish between general QoL and the current level of functioning as it is perceived by cancer patients.

NMIBC significantly affects a patient's daily life for various reasons [156-158]. Emerging understanding of the significant impact of NMIBC cancer treatment on patient QoL improves the recognition of the relevance of PROMs within this patient-group [150, 151, 156].

The limited evidence base for PROMs in NMIBC is since there are limited RCTs; no preprocedural baseline assessments are available in many cases; and limited longitudinal data is available to evaluate the impact on patient HRQoL over time. Moreover, lack of adherence to guidelines [151], as well as high heterogeneity between studies, remains a challenge [156].

12.2 General HRQoL status and PROM questionnaires

HRQoL in patients living with and beyond bladder cancer is worse than that reported by the general population and those with other common cancers and seems to be independent of therapy received and stage [150]. Systematic reviews have found that NMIBC patients have a substantial symptom and functional burden that impacts HRQoL throughout the induction period of treatment. However, HRQoL returns to baseline level values by the end of the maintenance period of treatment [150, 158, 159].

Psychological distress and physical symptoms of patients are intense at the time of diagnosis; however, these symptoms are transient in patients receiving BCG therapy [156, 158, 160-162]. Measured by EORTC QLQ C30 & QLQ NMIBC 24, a general worsening in function domains such as physical, emotional and social function is seen from baseline during the induction phase but nearly reaches baseline level by the end of the maintenance phase [156]. For symptoms domain scores, the largest increase worsening of scores is seen for fatigue and urinary symptoms, followed by insomnia and nausea/vomiting [156, 158]. Erectile and sexual function are affected; however, scores also return to baseline level by end of maintenance after one year [156, 158].

12.3 Burden of symptoms and impact on HRQoL

The Nimbus trial tested whether a reduced number of standard doses of BCG instillations could improve HRQoL due to a possible reduction in toxicity or burden. However, reducing the instillation frequency does not improve HRQoL in patients with high-grade NMIBC [160].

Patients with NMIBC frequently exhibit urinary tract symptoms and fatigue. These symptoms can be partly responsible for the initial impairment of HRQoL, in addition to the cancer diagnosis [162].

A prospective RCT of the efficacy, safety and impact on HRQoL of a conservative maintenance strategy of BCG compared to an alternative strategy documented that there was no difference in function or symptom scores at fourteen-month follow-up [163].

Longitudinal data from a cohort study including 1,019 patients with a four-year follow-up time, showed that HRQoL in NMIBC patients was comparable with that of the general population after four years [162]. Improvements were noted in insomnia, social functioning and three NMIBC-specific symptoms, while minor deteriorations in appetite and diarrhoea lasted until 51 months. HRQoL in some domains was worse for high-grade NMIBC; high European Association of Urology (EAU) risk group; initial Bacillus Calmette-Guérin (BCG) treatment; being female; and being younger (< 65 yrs.) [162].

Another longitudinal study assessed the association between HRQoL and adherence to the 2018 World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) lifestyle recommendations in Dutch patients with NMIBC. Higher adherence to WCRF/AICR recommendations for BMI, physical activity and diet were linked to improved HRQoL [162, 164].

Overall, patients experience a high impact on HRQoL at the time of diagnosis but longitudinal data document that patients experience a gradual return to initial HRQoL status when undergoing frequent TURBT and instillation therapy. No evidence was found describing whether MMC or BCG is superior regarding impact on HRQoL.

Recommendations	LE	GR
Assess patients before treatment for life-style behaviour, autonomy in daily life, comorbidities, age and family situation.	3	B
Inform, educate, comfort and motivate NMIBC and CIS patients regarding treatment impact on global health and when to expect to regain initial HRQoL status.	3	B
Inform patients prior to treatment that:		
• Most patients regain initial HRQoL status within one year.	3	B
• Most domains included in global HRQoL will return to initial levels except from physical function within one year.	2a	B
• Social, role and emotional functions, which are also associated with working status, are most severely impaired at the first cycle of BCG.	3	B
• Higher adherence to lifestyle recommendations for BMI, physical activity and diet can improve HRQoL.	3	B

13. Patient experience

Positive patient experiences are associated with patient safety, health outcomes and clinical effectiveness. To be able to understand the nurse's role, a mutual understanding of the concept is necessary.

Patient-Reported Experience Measures focus on the patient's overall experience of their healthcare, including their opinions about the care they have received and their perceptions regarding the impact of treatment. Patient experience can be measured as both objective events such as handling out written information about a procedure, or subjective evaluative measures about patient involvement in decisions on treatment [165]. Factors explaining and influencing the association between received care and patient-reported experience have been identified in a review, which found that patient-related factors such as expectations, age, health status and education influenced patient experience of received care. This means that some influencing factors are predefined and established before entering the healthcare system (sociodemographic background and certain expectations) and some influencing factors are formed in the meeting with the healthcare system [165].

Eight studies addressing patient experience with intravesical instillations were identified and the following items were described:

Treatment burden
In a study involving 150 patients, 55% of patients experienced time burden relating to BCG administration [151]. Similarly, treatment burden such as missed work, personal costs, having to bring a relative and the ability to perform regular daily work was also described in another study involving 233 patients undergoing BCG treatment [166]. In addition, a third study also identified issues related to delays returning to work or getting back to pre-treatment levels of activity [167].

Continuity of care
In an interview study of 26 patients, patients having different nurses experienced negative emotions, while those who had the same nurse, reported greater satisfaction. The study also described embarrassment due to lack of continuity in care [167]. An interview study with six patients that explored how patients experience influenced withdrawal from BCG treatment found that dignity in treatment was important and that continuity in care helped maintain patients' dignity [168].

Unmet needs

A study involving 586 patients with both MIBC and NMIBC found that 51% had unmet needs [169]. Interestingly, very small differences were found between groups in unmet needs. The most frequent unmet needs were:

- general information about cancer
- possible side effects to treatment
- how to manage side effects
- treatment advantages/disadvantages
- information on what symptoms to monitor and report in future [168, 169].

Treatment concerns/symptom impact

A small study investigated nocturia and insomnia in ten patients undergoing BCG treatment. The study found that 6/10 experienced nocturia and subsequently sleep disturbances. However, sleep quality restored to baseline in 5/6 patients one month after the end of treatment [170].

A prospective study with 108 patients investigated anxiety using the STAI-Y1 (State-Trait Anxiety Inventory for Adults) validated tool and found a moderate degree of anxiety in patients undergoing intravesical instillations at baseline and at three months, but after twelve months, anxiety scores had improved [157]. A major concern for patients having epirubicin or BCG seemed to be the procedure itself (i.e. waiting, urethral catheterisation, instillation, LUTS and so on) and not recurrence or disease progress [157].

Another interview study found that poor post-treatment care raised concern, particularly regarding unaddressed side effects. This study found that patients who withdraw from treatment felt treatment bereavement because they were unable to fulfil the planned BCG instillations [168].

Recommendations	LE	GR
Ensure continuity in care	4	C
Explore patient experience of treatment at each consultation	4	C

14. About the authors

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Kathryn's recent work includes the development of online learning modules in NMIBC, contributions to national bladder cancer care pathways, and co-authoring updates to the 2025 updated BAUN intravesical guidelines. She also supports broader initiatives aimed at standardising bladder cancer nursing practice and improving patient outcomes, aligning with GRIFT.

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Significant guidelines she has written include:

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- Patient Education for the Care of a Continent Urinary Diversion
- Care of the Indwelling Foley Catheter
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15. References

[1] Phillips B. Oxford Centre for Evidence-based Medicine Levels of Evidence. Updated by Jeremy Howick March 2009. 1998.
https://www.cebm.ox.ac.uk/resources/levels-of-evidence/oxford-centre-for-evidence-based-medicine-levels-of-evidence-march-2009

[2] International Agency for Research on Cancer. Estimated number of new cases in 2020, worldwide, both sexes, all ages. World Health Organization. 2021.
https://gco.iarc.fr/today/en

[3] Comperat E, Larre S, Roupret M, et al. Clinicopathological characteristics of urothelial bladder cancer in patients less than 40 years old. Virchows Arch. 2015;466:589–94.
https://www.ncbi.nlm.nih.gov/pubmed/25697540

[4] Burger M, Catto JW, Dalbagni G, et al. Epidemiology and risk factors of urothelial bladder cancer. Eur Urol. 2013;63:234–41.
https://www.ncbi.nlm.nih.gov/pubmed/22877502

[5] Teoh JY, Huang J, Ko WY, et al. Global Trends of Bladder Cancer Incidence and Mortality, and Their Associations with Tobacco Use and Gross Domestic Product Per Capita. Eur Urol. 2020;78:893–906.
https://www.ncbi.nlm.nih.gov/pubmed/32972792

[6] Freedman ND, Silverman DT, Hollenbeck AR, et al. Association between smoking and risk of bladder cancer among men and women. Jama. 2011;306:737–45.
https://www.ncbi.nlm.nih.gov/pubmed/21846855

[7] Laaksonen MA, MacInnis RJ, Canfell K, et al. The future burden of kidney and bladder cancers preventable by behavior modification in Australia: A pooled cohort study. Int J Cancer. 2020;146:874–83.
https://www.ncbi.nlm.nih.gov/pubmed/31107541

[8] Colt JS, Friesen MC, Stewart PA, et al. A case-control study of occupational exposure to metalworking fluids and bladder cancer risk among men. Occup Environ Med. 2014;71:667–74.
https://www.ncbi.nlm.nih.gov/pubmed/25201311

[9] Pesch B, Taeger D, Johnen G, et al. Screening for bladder cancer with urinary tumor markers in chemical workers with exposure to aromatic amines. Int Arch Occup Environ Health. 2014;87:715–24.
https://www.ncbi.nlm.nih.gov/pubmed/24129706

[10] Tyagi P, Tyagi S, Kaufman J, et al. Local drug delivery to bladder using technology innovations. Urol Clin North Am. 2006;33:519-30.
http://www.ncbi.nlm.nih.gov/pubmed/17011388

[11] Shariat SF, Chade DC, Karakiewicz PI, et al. Update on intravesical agents for non-muscle-invasive bladder cancer. Immunotherapy. 2010;2:381-92.
http://www.ncbi.nlm.nih.gov/pubmed/20635902

[12] Abern MR, Owusu RA, Anderson MR, et al. Perioperative intravesical chemotherapy in non-muscle-invasive bladder cancer: a systematic review and meta-analysis. Journal of the National Comprehensive Cancer Network: JNCCN. 2013;11:477–84. http://www.ncbi.nlm.nih.gov/pubmed/23584348

[13] Gandhi NM, Morales A, Lamm DL. Bacillus Calmette-Guerin immunotherapy for genitourinary cancer. BJU International. 2013;112:288––97 http://www.ncbi.nlm.nih.gov/pubmed/23517232

[14] Gontero P, Birtle A, Comperat E, Liedberg P. EAU Guidelines on Non-muscle-invasive Bladder Cancer (TaT1 and CIS). 2025 https://uroweb.org/guidelines/non-muscle-invasive-bladder-cancer

[15] Schmidt S, Kunath F, Coles B, Draeger DL, Krabbe LM, Dersch R, et al. Intravesical Bacillus Calmette-Guerin versus mitomycin C for Ta and T1 bladder cancer. The Cochrane database of systematic reviews. 2020;1:CD011935 https://www.ncbi.nlm.nih.gov/pubmed/31912907

[16] Scilipoti P, Slusarczyk A, de Angelis M, Soria F, Pradere B, Krajewski W, et al. The Role of Mitomycin C in Intermediate-risk Non-muscle-invasive Bladder Cancer: A Systematic Review and Meta-analysis. Eur Urol Oncol. 2024 https://www.ncbi.nlm.nih.gov/pubmed/38902138

[17] Health Products Regulatory Authority of Ireland. HPRA. Mitomycin medac 40mg powder - Summary of product characteristics. Accessed Jan 24th 2025. https://www.hpra.ie/img/uploaded/swedocuments/Licence_PA0623-016-002_26022024101510.pdf

[18] Health Products Regulatory Authority of Ireland. HPRA. BCG-medac, powder and solvent for suspension for intravesical use - Summary od product characteristics. Accessed Jan 24th 2025. https://www.hpra.ie/find-a-medicine/for-human-use/authorised-medicines/details/19330

[19] Bonkat G, Kranz J, Cai T, Geerlings SE, Koves B. EAU Guidelines on Urological Infections Edn. presented at the 40th Annual Congress Madrid. 2025 https://uroweb.org/guidelines/urological-infections

[20] Herr HW. Intravesical bacillus Calmette-Guerin outcomes in patients with bladder cancer and asymptomatic bacteriuria. The Journal of urology. 2012;187:435––7 http://www.ncbi.nlm.nih.gov/pubmed/22177154

[21] Anastasiadis Aa. Best practice in the treatment of nonmuscle invasive bladder cancer. Therapeutic Advances in Urology. 2012;4:13––32 http://www.ncbi.nlm.nih.gov/pubmed/22295042

[22] Lamm DL, Blumenstein BA, Crissman JD, Montie JE, Gottesman JE, Lowe BA, et al. Maintenance bacillus Calmette-Guerin immunotherapy for recurrent TA, T1 and carcinoma in situ transitional cell carcinoma of the bladder: a randomized Southwest Oncology Group Study. The Journal of urology. 2000;163:1124––9 http://www.ncbi.nlm.nih.gov/pubmed/10737480

[23] Shore ND, Palou Redorta J, Robert G, Hutson TE, Cesari R, Hariharan S, et al. Non-muscle-invasive bladder cancer: An overview of potential new treatment options. Urol Oncol. 2021;39:642–63
https://www.ncbi.nlm.nih.gov/pubmed/34167873

[24] Centers for Disease Control and Prevention. NIOSH List of Hazardous Drugs in Healthcare Settings, 2024. NIOSH. 2024.
https://www.cdc.gov/niosh/docs/2025-103/.

[25] European Comission. Guidance for the safe management of hazardous medicinal products at work,. Directorate-General for Employment, Social Affairs and Inclusion. 2023
https://op.europa.eu/en/publication-detail/-/publication/8e504373-8a77-11ee-99ba-01aa75ed71a1/language-en

[26] Occupational Safety and Health Administration. OSHA Technical Manual (OTM) OSHA Instruction TED 01-00-015 - Hazardous Drugs. Accessed Jan 24th 2025.
https://www.osha.gov/hazardous-drugs

[27] European Parliament. Directive 2004/37/EC of the European Parliament and of the Council of 29 April 2004 on the protection of workers from the risks related to exposure to carcinogens, mutagens or reprotoxic substances at work (Sixth individual Directive within the meaning of Article 16(1) of Council Directive 89/391/EEC). 2004
https://eur-lex.europa.eu/eli/dir/2004/37/2024-04-08

[28] Centers for Disease Control and Prevention. NIOSH Closed System Drug-Transfer Device (CSTD) Research. National Institute for Occupational Safety and Health. 2024
https://www.cdc.gov/niosh/healthcare/hazardous-drugs/cstd-research.html

[29] Suspiro A, Prista J. Biomarkers of occupational exposure do anticancer agents: a minireview. Toxicology letters. 2011;207:42––52
http://www.ncbi.nlm.nih.gov/pubmed/21911042

[30] Boiano JM, Hull RD. Development of a National Occupational Exposure Survey and Database associated with NIOSH hazard surveillance initiatives. Applied occupational and environmental hygiene. 2001;16:128––34
http://www.ncbi.nlm.nih.gov/pubmed/11217699

[31] Fransman W. Antineoplastic drugs: Occupational exposure and health risks. 2006. p. 1––166.

[32] Lawson CC, Rocheleau CM, Whelan EAa. Occupational exposures among nurses and risk of spontaneous abortion. American journal of obstetrics and gynecology. 2012;206:327.e1––8
http://www.ncbi.nlm.nih.gov/pubmed/22304790

[33] McDiarmid MA, Oliver MS, Roth TS, Rogers B, Escalante C. Chromosome 5 and 7 abnormalities in oncology personnel handling anticancer drugs. Journal of occupational and environmental medicine / American College of Occupational and Environmental Medicine. 2010;52:1028––34
http://www.ncbi.nlm.nih.gov/pubmed/20881619

[34] Meijster T, Fransman W, Veldhof R, Kromhout H. Exposure to antineoplastic drugs outside the hospital environment. The Annals of occupational hygiene. 2006;50:657––64
http://www.ncbi.nlm.nih.gov/pubmed/16679337

[35] Rogers B, Emmett EA. Handling antineoplastic agents: urine mutagenicity in nurses. Image--the journal of nursing scholarship. 1987;19:108––13
http://www.ncbi.nlm.nih.gov/pubmed/3311973

[36] Yoshida J, Tei G, Mochizuki C, Masu Y, Koda S, Kumagai S. Use of a closed system device to reduce occupational contamination and exposure to antineoplastic drugs in the hospital work environment. The Annals of occupational hygiene. 2009;53:153––60
http://www.ncbi.nlm.nih.gov/pubmed/19261696

[37] Abu-Alhaija D, Bakas T, Shaughnessy E, Miller E. The Factors That Influence Chemotherapy Exposure Among Nurses: An Integrative Review. Workplace Health Saf. 2023;71:212–27
https://www.ncbi.nlm.nih.gov/pubmed/36703295

[38] Brixey MT. Chemotherapeutic agents: intravesical instillation. Urologic Nursing. 1988;9:4––6
http://www.ncbi.nlm.nih.gov/pubmed/3145560

[39] Games J. Nursing implications in the management of superficial bladder cancer. Seminars in Urologic Oncology. 1996;14:36––40
http://www.ncbi.nlm.nih.gov/pubmed/8727809

[40] Mellinger E, Skinker L, Sears D, Gardner D, Shult P. Safe handling of chemotherapy in the perioperative setting. AORN Journal. 2010;91:435––53
http://www.ncbi.nlm.nih.gov/pubmed/20362210

[41] Centers for Disease Control and Prevention. NIOSH Alert. Preventing Occupational Exposures to Antineoplastic and Other Hazardous Drugs in Health Care Settings. National Institute for Occupational Safety and Health. 2004:1––58.
http://www.cdc.gov/niosh/docs/2004-165/pdfs/2004-165.pdf

[42] ASHP guidelines on compounding sterile preparations. Am J Health Syst Pharm. 2014;71:145–66
https://pubmed.ncbi.nlm.nih.gov/24375608/

[43] Clark BA, Sessink PJM. Use of a closed system drug-transfer device eliminates surface contamination with antineoplastic agents. Journal of oncology pharmacy practice : official publication of the International Society of Oncology Pharmacy Practitioners. 2013;19:99––104
http://www.ncbi.nlm.nih.gov/pubmed/23292973

[44] Landeck L, Gonzalez E, Koch OM. Handling chemotherapy drugs-Do medical gloves really protect? International journal of cancer Journal international du cancer. 2014
http://www.ncbi.nlm.nih.gov/pubmed/24978061.

[45] M.M. PMO. Safe handling of hazardous drugs (3rd ed.). Oncology Nursing Society. 2018

[46] Fransman W, Huizer D, Tuerk J, Kromhout H. Inhalation and dermal exposure to eight antineoplastic drugs in an industrial laundry facility. Int Arch Occup Environ Health. 2007;80:396––403
http://www.ncbi.nlm.nih.gov/pubmed/17021843.

[47] Organon Teknika Corporation LLC. BCG Live (for intravesical use) TICE \textregistered BCG. 2009. p. 1––11.
http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM163039.pdf

[48] Raviv G, Pinthus JH, Shefi S, Mor Y, Kaufman-Francis K, Levron J, et al. Effects of intravesical chemotherapy and immunotherapy on semen analysis. Urology. 2005;65:765––7
http://www.ncbi.nlm.nih.gov/pubmed/15833524

[49] Garg M, Sankhwar SN, Goel A, Kumar M, Singh BP, Singh V, et al. Effect of intravesical immunotherapy on sperm parameters in young patients with non--muscle-invasive bladder carcinoma: prospective analysis. Clinical genitourinary cancer. 2014;12:e83––6
http://www.ncbi.nlm.nih.gov/pubmed/24411194

[50] Vahr Lauridsen S, Chagani S, Daniels A, et al. Urethral intermittent catheterisation in adults – including urethral intermittent dilatation - Evidence-based Guidelines for Best Practice in Urological Health Care. 1st ed: EAUN Office; 2024.
https://nurses.uroweb.org/guidelines/urethral-intermittent-catheterisation-in-adults

[51] Roper N, Logan WW, Tierney AJ. The Roper-Logan-Tierney Model of Nursing: Based on Activities of Living. 1 ed: Elsevier Health Sciences.; 2000.

[52] Kwan ML, Wang Z, Haque R, Lee VS, Roh JM, Ergas IJ, et al. The Influence of Dietary Isothiocyanates on the Effectiveness of Mitomycin C and Bacillus Calmette-Guérin in Treating Nonmuscle-Invasive Bladder Cancer. J Urol. 2024;212:420–30
https://pubmed.ncbi.nlm.nih.gov/38848543/

[53] Cliff AM, Heatherwick B, Scoble J, N.J P. The effect of fasting or desmopressin before treatment on the concentration of mitomycin C during intravesical administration. BJU International. 2000;86:644––7
http://www.ncbi.nlm.nih.gov/pubmed/11069370

[54] Rink M, Xylinas E, Babjuk M, Pycha A, Karakiewicz PI, Novara G, et al. Smoking reduces the efficacy of intravesical bacillus Calmette-Guerin immunotherapy in non-muscle-invasive bladder cancer. European urology. 2012;62:1201––6
http://www.ncbi.nlm.nih.gov/pubmed/22980442

[55] Sfakianos JP, Shariat SF, Favaretto RL, Rioja J, Herr HW. Impact of smoking on outcomes after intravesical bacillus Calmette-Guerin therapy for urothelial carcinoma not invading muscle of the bladder. BJU International. 2011;108:526––30
http://www.ncbi.nlm.nih.gov/pubmed/21114611

[56] Andius P, Damm O, Holmang S. Prognostic factors in patients with carcinoma in situ treated with intravesical bacille Calmette-Guerin. Scandinavian Journal of Urology and Nephrology. 2004;38:285––90
http://www.ncbi.nlm.nih.gov/pubmed/15669587

[57] Stone MM, Vannier AM, Storch SK, Peterson C, Nitta AT, Zhang Y. Meningitis Due to Iatrogenic Bcg Infection in Two Immunocompromised Children — NEJM. The New England Journal of Medicine. 1995;333:561––3
http://www.nejm.org/doi/full/10.1056/NEJM199508313330905

[58] Shelley MD, Mason MD, Kynaston H. Intravesical therapy for superficial bladder cancer: A systematic review of randomised trials and meta-analyses. Cancer Treatment Reviews. 2010;36:195––205
http://www.ncbi.nlm.nih.gov/pubmed/20079574

[59] Badalament RA, Farah RN. Treatment of superficial bladder cancer with intravesical chemotherapy. Seminars in Surgical Oncology. 1997;13:335––41
http://www.ncbi.nlm.nih.gov/pubmed/9259089

[60] Johnson MH, Nepple KG, Peck V, et al. Randomized controlled trial of oxybutynin extended release versus placebo for urinary symptoms during intravesical bacillus Calmette-Guerin treatment. Journal of Urology. 2013;189:1268––74
http://www.ncbi.nlm.nih.gov/pubmed/23123375

[61] Shah JB, Kamat AM. Strategies for Optimizing Bacillus Calmette-Guerin. Urol Clin North Am. 2013;40:211–8.
http://www.ncbi.nlm.nih.gov/pubmed/23540779

[62] Switters DM, Soares SE, White RWV. Nursing care of the patient receiving intravesical chemotherapy. Urol Nurs. 1992;12:136–9.
http://www.ncbi.nlm.nih.gov/pubmed/1465638

[63] Hariri MK, Rajabalian M-B, Narouie B, rohollahpour S, Rostami G, Ahmadzade M. Comparison of the efficacy of BCG intravesical immunotherapy using the conventional Rotisserie method with the non-Rotisserie method. Afr J Urol. 2023;29:54.
https://link.springer.com/article/10.1186/s12301-023-00375-1

[64] Spencer BA, McBride RB, Hershman DL, et al. Adjuvant intravesical bacillus calmette-guerin therapy and survival among elderly patients with non-muscle-invasive bladder cancer. J Oncol Pract/ Am Soc Clin Onc. 2013;9:92–8.
http://www.jop.ascopubs.org/content/9/2/92.short

[65] Lim D, Izawa JI, Middlebrook P, et al. Bladder perforation after immediate postoperative intravesical instillation of mitomycin C. Can Urol Assoc J. 2010;4:E1–3.
http://www.ncbi.nlm.nih.gov/pubmed/20174483

[66] Akbulut Z, Canda AE, Atmaca AF, et al. BCG sepsis following inadvertent intravenous BCG administration for the treatment of bladder cancer can be effectively cured with anti-tuberculosis medications. N Z Med J. 2010;123:72–7.
http://www.ncbi.nlm.nih.gov/pubmed/21317964

[67] Kamel AIa. Low dose BCG regimen in T1 transitional cell carcinoma of the bladder: long term results. J Egypt Natl Canc Inst. 2009;21:151–5.
http://www.ncbi.nlm.nih.gov/pubmed/21057566

[68] Geng V, Lurvink H, Pearce I, et al. Catheterisation, Indwelling catheterisation in adults, Urethral and Suprapubic – Evidence-based Guidelines for Best Practice in Urological Health Care. 1st ed: EAUN Office; 2024.
https://nurses.uroweb.org/guidelines/indwelling-catheterisation-in-adults-urethral-and-suprapubic

[69] Pugliese JM, Greene RN, Peterson AC. Intravesical therapy use in the high risk patient: practice patterns in an equal access healthcare institution before and after national guidelines. Can J Urol. 2009;16:4927–31.
http://www.ncbi.nlm.nih.gov/pubmed/20003671

[70] Cindolo L, Palmieri EA, Autorino R, et al. Standard versus hydrophilic catheterization in the adjuvant treatment of patients with superficial bladder cancer. Urol Int. 2004;73:19–22.
http://www.ncbi.nlm.nih.gov/pubmed/15263787

[71] Hedlund H, Hjelms K, Jonsson O, et al. Hydrophilic versus non-coated catheters for intermittent catheterization. Scand J Urol Nephrol. 2001;35:49–53.
http://www.ncbi.nlm.nih.gov/pubmed/11291688

[72] De Ridder DJMK, Everaert K,Fernández LG, et al. Intermittent catheterisation with hydrophilic-coated catheters (SpeediCath) reduces the risk of clinical urinary tract infection in spinal cord injured patients: a prospective randomised parallel comparative trial. Eur Urol. 2005;48:991–5.
http://www.ncbi.nlm.nih.gov/pubmed/16137822

[73] Loertzer H, Brake M, Horsch R, et al. Do bacteriostatic urethral lubricants affect the clinical efficacy of intravesical bacillus Calmette-Guerin therapy? Urology. 2001;57:900–5.
www.ncbi.nlm.nih.gov/pubmed/11337290

[74] Serretta V. Optimizing intravesical chemotherapy in patient with non muscle invasive bladder carcinoma. Arch Ital Urol Androl. 2008;80:143–8.
http://www.ncbi.nlm.nih.gov/pubmed/19235430

[75] De Bruijn EA SH, van Helsdingen PJ, et al. Pharmacodynamics and pharmacokinetics of intravesical mitomycin C upon different dwelling times. Int J Cancer. 1992;51:359–64.
http://www.ncbi.nlm.nih.gov/pubmed/1592527

[76] Burger M, Oosterlinck W, Konety B, et al. ICUD-EAU international consultation on bladder cancer 2012: Non-muscle-invasive urothelial carcinoma of the bladder. Eur Urol. 2013;63:36–44.
http://www.ncbi.nlm.nih.gov/pubmed/22981672

[77] Kaasinen E, Rintala E, Hellstrom P, et al. Factors explaining recurrence in patients undergoing chemoimmunotherapy regimens for frequently recurring superficial bladder carcinoma. Eur Urol. 2002;42:167–74.
http://www.ncbi.nlm.nih.gov/pubmed/12160589

[78] Wang W, Chen Y, Gu J. Effectiveness of integrated nursing interventions in enhancing patient outcomes during postoperative intravesical instillation for non-muscle invasive bladder cancer: A comparative study. Medicine (Baltimore). 2024;103:e36871. https://pubmed.ncbi.nlm.nih.gov/38489732/

[79] Griffin JG, Holzbeierlein J. Side Effects of Perioperative Intravesical Treatment and Treatment Strategies for These Side Effects. Urol Clin North Am. 2013;40:197––210 http://www.ncbi.nlm.nih.gov/pubmed/23540778

[80] Au JL, Badalament RA, Wientjes MG, et al. Methods to improve efficacy of intravesical mitomycin C: results of a randomized phase III trial. J Natl Cancer Inst. 2001;93:597–604. http://www.ncbi.nlm.nih.gov/pubmed/11309436

[81] Kapoor R, Vijjan V, Singh P. Bacillus Calmette-Guerin in the management of superficial bladder cancer. Indian J Urol. 2008;24:72–6. https://pubmed.ncbi.nlm.nih.gov/19468364/

[82] Katz G, Hackett RL, Wajsman Z. Bladder wall fibrosis following intravesical mitomycin treatment for superficial bladder cancer. Urology. 1996;47:928–9. http://www.ncbi.nlm.nih.gov/pubmed/8677595

[83] Thrasher JB, Crawford ED. Complications of intravesical chemotherapy. Urol Clin North Am. 1992;19:529–39. http://www.ncbi.nlm.nih.gov/pubmed/1636237

[84] Drago PC, Badalament RA, Lucas J, et al. Bladder wall calcification after intravesical mitomycin C treatment of superficial bladder cancer. J Urol. 1989;142:1071–2. http://www.ncbi.nlm.nih.gov/pubmed/2507794

[85] Inglis JA, Tolley DA, Grigor KM. Allergy to mitomycin C complicating topical administration for urothelial cancer. BJU Int. 1987;59:547–9. http://www.ncbi.nlm.nih.gov/pubmed/3120846

[86] Wajsman Z, McGill W, Englander L. Severely contracted bladder following intravesical mitomycin C therapy. J Urol. 1983;130:340–1. http://www.ncbi.nlm.nih.gov/pubmed/6410085

[87] Bosschieter J, Nieuwenhuijzen JA, van Ginkel T, et al. Value of an Immediate Intravesical Instillation of Mitomycin C in Patients with Non-muscle-invasive Bladder Cancer: A Prospective Multicentre Randomised Study in 2243 patients. Eur Urol. 2018;73:226–32. https://pubmed.ncbi.nlm.nih.gov/28705539/

[88] Fiore AA, Iorio B, Vennarecci G, et al. Papillary-like bladder calcifications following intravesical mitomycin C. A case report. Minerva Urol Nefrol. 1993;45:171–3. http://www.ncbi.nlm.nih.gov/pubmed/8023227

[89] Llopis M, Moreno J, Botella R, et al. Incrusted cystitis after intravesical mitomycin C treatment. Acta Urol Belg. 1993;61:21–3. http://www.ncbi.nlm.nih.gov/pubmed/8256682

[90] De Groot AC, Conemans JMH. Systemic allergic contact dermatitis from intravesical instillation of the antitumor antibiotic mitomycin C. Contact Dermat. 1991;24:201–9. http://www.ncbi.nlm.nih.gov/pubmed/1831098

[91] Arregui MA, Aguirre A, Gil N, et al. Dermatitis due to mitomycin C bladder instillations: Study of 2 cases. Contact Dermat. 1991;24:368–70. http://www.ncbi.nlm.nih.gov/pubmed/1832619

[92] Eijsten A, Knonagel H, Hotz E, et al. Reduced bladder capacity in patients receiving intravesical chemoprophylaxis with mitomycin C. BJU Int. 1990;66:386–8. https://pubmed.ncbi.nlm.nih.gov/2121309/

[93] Baker WC, Russo MA, deVere White RW. Severe bladder contracture in patient receiving intravesical mitomyin C for superficial bladder cancer. Urology. 1987;30:357–8. http://www.ncbi.nlm.nih.gov/pubmed/3116739

[94] Stoehr B, Mueller T, Granig T, et al. Increasing patient comfort by optimized postoperative administration of intravesical mitomycin C. BJU Int 2008;102:1556–9. http://www.ncbi.nlm.nih.gov/pubmed/18691179

[95] Mertens LS, Meinhardt W, Rier WB, et al. Extravasation of intravesical chemotherapy for non-muscle-invasive bladder cancer. Urol Int. 2012;89:332–6. http://www.ncbi.nlm.nih.gov/pubmed/22965138

[96] Wilson JRF, Turney BW, LeMonnier K, et al. A comparison of two BCG instillation regimens for non-muscle invasive bladder cancer: A retrospective cohort analysis of side effect profiles. BJU Int 2010;3:241–8. https://www.sciencedirect.com/science/article/abs/pii/S1875974210000431

[97] Bohle A, Jocham D, Bock PR. Intravesical bacillus Calmette-Guerin versus mitomycin C for superficial bladder cancer: a formal meta-analysis of comparative studies on recurrence and toxicity. J Urol. 2003;169:90–5. https://www.ncbi.nlm.nih.gov/pubmed/12478111

[98] Van der Meijden APM, Sylvester R, Oosterlinck W, et al. Maintenance Bacillus Calmette-Guerin for Ta T1 bladder tumors is not associated with increased toxicity: results from a European Organisation for Research and Treatment of Cancer Genito-Urinary Group Phase III Trial. Eur Urol. 2003;44:429–4. http://www.ncbi.nlm.nih.gov/pubmed/14499676

[99] Witjes JA PJ, Soloway M, et al. Clinical practice recommendations for the prevention and management of intravesical therapy-associated adverse events. Eur Urol Suppl. 2008;7:667–74. http://www.europeanurology.com/article/S1569-9056(08)00110-3/abstract

[100] Palou J, Rodriguez-Villamil L, Andreu-Crespo A, Salvador-Bayarri J, Vicente-Rodriguez J. Intravesical treatment of severe bacillus Calmette-Guerin cystitis. Int Urol Nephrol. 2001;33:485–9. https://www.ncbi.nlm.nih.gov/pubmed/12230277

[101] Falkensammer C, Gozzi C, Hager M, et al. Late occurrence of bilateral tuberculous-like epididymo-orchitis after intravesical bacille Calmette-Guerin therapy for superficial bladder carcinoma. Urology. 2005;65:175.
https://www.ncbi.nlm.nih.gov/pubmed/15667898

[102] Tinazzi E, Ficarra V, Simeoni S, et al. Reactive arthritis following BCG immunotherapy for urinary bladder carcinoma: a systematic review. Rheumatol int. 2006;26:481–8.
https://www.ncbi.nlm.nih.gov/pubmed/16220289

[103] European Medicines Agency. Disabling and potentially permanent side effects lead to suspension or restrictions of quinolone and fluoroquinolone antibiotics. https://www.ema.europa.eu/en/medicines/human/referrals/quinolone-fluoroquinolone-containing-medicinal-products

[104] Chowdhury AR, Dey RK. Penile tuberculosis following intravesical Bacille Calmette-Guerin immunotherapy. Indian J Urol. 2013;29:64–6.
http://www.ncbi.nlm.nih.gov/pubmed/23671370

[105] Lestre SIA, Gameiro CD, Joao A, et al. Granulomas of the penis: a rare complication of intravesical therapy with Bacillus Calmette-Guerin. An Bras Dermatol. 2011;86:759–62.
http://www.ncbi.nlm.nih.gov/pubmed/21987145

[106] French CG, Hickey L, Bell DG. Caseating granulomas on the glans penis as a complication of bacille calmette-guerin intravesical therapy. Rev Urol. 2001;3:36–8.
http://www.ncbi.nlm.nih.gov/pubmed/16985688

[107] Cheung JMK, Hou SSM, Yip SKH, et al. An unusual cause of retention of urine after intravesical bacillus calmette-guerin therapy for superficial bladder cancer. Hong Kong Med J. 2011;17:492–4.
https://pubmed.ncbi.nlm.nih.gov/22147321/

[108] Galvan L, Ayani I, Arrizabalaga MJ, et al. Intravesical BCG therapy of superficial bladder cancer: Study of adverse effects. J Clin Pharm Ther. 1994;19:101–4.
http://www.ncbi.nlm.nih.gov/pubmed/8071388

[109] Lamm DLa. Incidence and treatment of complications of bacillus Calmette-Guerin intravesical therapy in superficial bladder cancer. J Urol. 1992;147:596–600.
http://www.ncbi.nlm.nih.gov/pubmed/1538436

[110] Witjes JA, Palou J, Soloway M, et al. Clinical Practice Recommendations for the Prevention and Management of Intravesical Therapy–Associated Adverse Events. Eur Urol Suppl. 2008;7:667–74.
https://www.sciencedirect.com/science/article/abs/pii/S1569905608001103

[111] Schreinemachers LMHa. Intravesical and intradermal Bacillus Calmette-Guerin application. A phase I study to the toxicity of a Dutch Bacillus Calmette-Guerin preparation in patients with superficial bladder cancer. Eur Urol. 1988;14:15–21.
http://www.ncbi.nlm.nih.gov/pubmed/2963745

[112] Lowther C, Miedler JD, Cockerell CJ. Id-like reaction to BCG therapy for bladder cancer. Cutis. 2013;91:145–51.
http://www.ncbi.nlm.nih.gov/pubmed/23617086
[113] Orihuela E, Herr HW, Pinsky CM, et al. Toxicity of intravesical BCG and its management in patients with superficial bladder tumors. Cancer. 1987;60:326–33.
http://www.ncbi.nlm.nih.gov/pubmed/3594369
[114] Linn R, Klimberg IW, Wajsman Z. Persistent acid-fast bacilli following intravesical bacillus Calmette-Guerin. J Urol. 1989;141:1197–8.
http://www.ncbi.nlm.nih.gov/pubmed/2709508
[115] Strock V, Dotevall L, Sandberg T, C.K G, S H. Late bacille Calmette-Guerin infection with a large focal urinary bladder ulceration as a complication of bladder cancer treatment. BJU Int. 2011;107:1592–7.
http://www.ncbi.nlm.nih.gov/pubmed/21166754
[116] Spirnak JP, Lubke WL, Thompson IM, et al. Dystrophic bladder wall calcifications following intravesical BCG treatment for superficial transitional cell carcinoma of bladder. Urology. 1993;42:89–92.
https://pubmed.ncbi.nlm.nih.gov/8328131/
[117] Suzuki S, Shinohara N, Harabayashi T, et al. Complications of bacillus Calmette-Guerin therapy in superficial urothelial cancer: Clinical analysis and implications. Int J Clin Oncol. 2002;7:289–93.
http://www.ncbi.nlm.nih.gov/pubmed/12402062
[118] Costiniuk CT, Sharapov AA, Rose GW, et al. Mycobacterium bovis abdominal aortic and femoral artery aneurysms following intravesical bacillus Calmette-Guerin therapy for bladder cancer. Cardiovasc Pathol. 2010;19:e29–e32.
http://www.ncbi.nlm.nih.gov/pubmed/19026573
[119] Vegt PDJa. Does isoniazid reduce side effects of intravesical bacillus Calmette- Guerin therapy in superficial bladder cancer? Interim results of European Organization for Research and Treatment of Cancer protocol 30911. J Urol. 1997;157:1246–9.
http://www.ncbi.nlm.nih.gov/pubmed/9120912
[120] Martinez-Caceres P, Rubio-Briones J, Palou J, et al. Prevesical and inguinal abscess following intravesical BCG instillation. Scand J Urol Nephrol. 1998;32:409–10.
http://www.ncbi.nlm.nih.gov/pubmed/9925006
[121] Gonzalez JA, Marcol BR, Wolf MC. Complications of intravesical Bacillus Calmette-Guerin: A case report. J Urol. 1992;148:1892–3.
https://pubmed.ncbi.nlm.nih.gov/1433632/
[122] Holmes BJ, LaRue RW, Black JH, 3rd, et al. Mycotic aortic aneurysm due to intravesical BCG immunotherapy: Clinical manifestations and diagnostic challenges. Int J Mycobacteriol. 2014;3:60–5.
https://pubmed.ncbi.nlm.nih.gov/26786225/

[123] Lorenzo JF, López Arquillo IM, Rey JV. Primary aortoenteric fistula after intravesical instillation of Bacillus Calmette-Guérin for bladder cancer. Vascular. 2023;32:952–6. https://pubmed.ncbi.nlm.nih.gov/37148206/

[124] Senes AT, Badet L, Lyonnet D, et al. Granulomatous renal masses following intravesical bacillus Calmette Guerin therapy: the central unaffected calyx sign. Br J Radiol. 2007;80:e230–3. http://www.ncbi.nlm.nih.gov/pubmed/17959911

[125] Garcia JE, Thiel DD, Broderick GA. BCG pyelonephritis following intravesical therapy for transitional cell carcinoma. Can J Urol. 2007;14:3523–5. http://www.ncbi.nlm.nih.gov/pubmed/17466161

[126] Abdullah OD, Kamran A, Fozia N, et al. Frequency of Complications Post-Intravesical BCG Instillation in Patients with Superficial Urinary Bladder Carcinoma. Pak J Med Health Sci. 2022;16:293. https://pjmhsonline.com/index.php/pjmhs/article/view/1982

[127] Anis O, Yogev D, Dotan A, et al. Autoimmune disorders caused by intravesical bacillus Calmette-Guerine treatment: A systematic review. Autoimmun Rev. 2023;22:103329. https://pubmed.ncbi.nlm.nih.gov/37061015/

[128] Witjes JA, Vriesema JLJ, Brinkman K, et al. Mycotic aneurysm of the popliteal artery as a complication of intravesical BCG therapy for superficial bladder cancer: Case report and literature review. Urol Int 2003;71:430–2. https://pubmed.ncbi.nlm.nih.gov/14646447/

[129] Damm O, Briheim G, Hagstrom T, et al. Ruptured mycotic aneurysm of the abdominal aorta: A serious complication of intravesical instillation bacillus Calmette-Guerin therapy. J Urol. 998;159:984. http://www.ncbi.nlm.nih.gov/pubmed/9474201

[130] Nam EY, Na SH, Kim SY, et al. Infected Aortic Aneurysm caused by Mycobacterium bovis after Intravesical Bacillus Calmette-Guérin Treatment for Bladder Cancer. Infect Chemother. 2015;47:256–60. https://pubmed.ncbi.nlm.nih.gov/26788410/

[131] Matsuoka Y, Taoka R, Kohashiguchi K, et al. Efficacy and toxicity of intravesical Bacillus Calmette-Guérin therapy in elderly patients with non-muscle-invasive bladder cancer. Curr Urol 2021;15. https://pubmed.ncbi.nlm.nih.gov/34084117/

[132] Jose Manzanera Escribano M MRE, Odriozola Grijalba M, et al. Acute renal failure due to interstitial nephritis after intravesical instillation of BCG. Clin Exp Nephrol. 2007;11:238–40. http://www.ncbi.nlm.nih.gov/pubmed/17891353

[133] Gao CQ, Mithani R, Leya J, Dawravoo L, et al. Granulomatous hepatitis, choroiditis and aortoduodenal fistula complicating intravesical Bacillus Calmette-Guerin therapy: Case report. BMC Infect Dis. 2011;11. http://www.ncbi.nlm.nih.gov/pubmed/21961922

[134] Ozbakkaloglu B, Tunger O, Surucuoglu S, et al. Granulomatous hepatitis following intravesical bacillus Calmette-Guerin therapy. Int Urol Nephrol. 1999;31:49–53. http://www.ncbi.nlm.nih.gov/pubmed/10408303

[135] Geldmacher H, Taube C, Markert U, et al. Nearly fatal complications of cervical lymphadenitis following BCG immunotherapy for superficial bladder cancer. Respiration. 2001;68:420–1. http://www.ncbi.nlm.nih.gov/pubmed/11464093

[136] Pancaldi P, Van Linthoudt D, Alborino D, et al. Reiter's syndrome after intravesical Bacillus Calmette-Guerin treatment for superficial bladder carcinoma. Br J Rheumatol. 1993;32:1096–8. http://www.ncbi.nlm.nih.gov/pubmed/8252321

[137] Josephson CB, Al-Azri S, Smyth DJ, et al. A case of Pott's disease with epidural abscess and probable cerebral tuberculoma following Bacillus Calmette-Guerin therapy for superficial bladder cancer. Can J Infect Dis Med Microbiol. 2010;21:e75–e8. https://pubmed.ncbi.nlm.nih.gov/21358881/

[138] Agrawal MS, Agrawal M, Bansal S, et al. The Safety and Efficacy of Different Doses of Bacillus Calmette Guerin in Superficial Bladder Transitional Cell Carcinoma. Urology. 2007;70:1075–8. http://www.ncbi.nlm.nih.gov/pubmed/18158020

[139] Miyazaki M, Yoshiiwa T, Ishihara T, et al. Tuberculous Spondylitis following Intravesical Bacillus Calmette-Guerin for Bladder Cancer. Case Rep Orthop. 2016;2016:6741284. https://pubmed.ncbi.nlm.nih.gov/27313927/

[140] Topazio L, Miano R, Maurelli V, et al. Could hyaluronic acid (HA) reduce Bacillus Calmette-Guérin (BCG) local side effects? Results of a pilot study. BMC Urol. 2014;14:64. https://pubmed.ncbi.nlm.nih.gov/25123116/

[141] Canepa G, Campodonico F, Tamagno S, et al. Adelmidrol + hyaluronic acid in the treatment of symptoms associated with intravesical anticancer therapy in non-muscle invasive bladder cancer. An observational retrospective investigation. Pelviperineology. 2023;42:5–11. https://pelviperineology.org/articles/adelmidrol-hyaluronic-acid-in-the-treatment-of-symptoms-associated-with-intravesical-anticancer-therapy-in-non-muscle-invasive-bladder-cancer-an-observational-retrospective-investigation/PPj.2023.42.01.2023-1-2

[142] Imperatore V, Creta M, Di Meo S, et al. Intravesical administration of combined hyaluronic acid and chondroitin sulfate can improve symptoms in patients with refractory bacillus Calmette-Guerin-induced chemical cystitis: Preliminary experience with one-year follow-up. Arch Ital Urol Androl. 2018;90:11–4. https://pubmed.ncbi.nlm.nih.gov/29633792/

[143] Gubbiotti M, Rubilotta E, Bacchiani M, et al. Intravesical administration of highly concentrated hyaluronic acid and chondroitin sulfate as add-on therapy for chemical cystitis induced by Bacillus Calmette-Guérin (BCG) immunotherapy. Int Urol Nephrol. 2025;57:2033–9. https://pubmed.ncbi.nlm.nih.gov/39821149/

[144] Numakura K, Kobayashi M, Ishida T, et al. Effect of Levofloxacin on the Efficacy and Adverse Events in Intravesical Bacillus Calmette-Guerin Treatment for Bladder Cancer: Results of a Randomized, Prospective, Multicenter Study. Eur Urol Focus. 2022;8:1666–72. https://pubmed.ncbi.nlm.nih.gov/35717522/

[145] Damiano R, De Sio M, Quarto G, et al. Short-term administration of prulifloxacin in patients with nonmuscle-invasive bladder cancer: an effective option for the prevention of bacillus Calmette-Guerin-induced toxicity? BJU Int. 2009;104:633–9. https://www.ncbi.nlm.nih.gov/pubmed/19298412

[146] Ecclestone H, Hamid R. Intravesical Bacillus Calmette-Guerin Cystitis. Curr Bladder Dysfunct Rep. 2017;12:207–11. https://link.springer.com/article/10.1007/s11884-017-0437-0

[147] Koch GE, Smelser WW, Chang SS. Side Effects of Intravesical BCG and Chemotherapy for Bladder Cancer: What They Are and How to Manage Them. Urology. 2021;149:11–20. https://pubmed.ncbi.nlm.nih.gov/33181123/

[148] Nouhaud FX, Rigaud J, Saint F, et al. Final results of the phase III URO-BCG 4 multicenter study: efficacy and tolerance of one-third dose BCG maintenance in nonmuscle invasive bladder cancer. Anticancer Drugs. 2017;28:335–40. https://pubmed.ncbi.nlm.nih.gov/27902496/

[149] Danielsson G, Thiel T, Thulin H. Bladder Instillation Therapy Form (BITF)—Nursing Instrument for Intravesical Bacillus Calmette-Guérin Instillations. Int J Urol Nurs. 2025;19. https://onlinelibrary.wiley.com/doi/10.1111/ijun.70037

[150] Catto JWF, Downing A, Mason S, et al. Quality of Life After Bladder Cancer: A Cross-sectional Survey of Patient-reported Outcomes. Eur Urol. 2021;79:621–32. https://pubmed.ncbi.nlm.nih.gov/33581875/

[151] Kopenhafer L, Thompson A, Chang J, et al. Patient experience and unmet needs in high-risk nonmuscle-invasive bladder cancer: Insights from qualitative interviews and a cross-sectional survey. Urol Oncol. 2024;42:70.e1–.e10. https://pubmed.ncbi.nlm.nih.gov/38272755/

[152] Rammant E, Fox L, Beyer K, et al. The current use of the EORTC QLQ-NMIBC24 and QLQ-BLM30 questionnaires for the assessment of health-related quality of life in bladder cancer patients: a systematic review. Qual Life Res. 2023;32:2127–35. https://www.ncbi.nlm.nih.gov/pubmed/36648569

[153] Witjes JA. Follow-up in non-muscle invasive bladder cancer: facts and future. World J Urol. 2021;39:4047–53. https://pubmed.ncbi.nlm.nih.gov/33367941/

[154] Aaronson NK, Ahmedzai S, Bergman B, et al. The European Organization for Research and Treatment of Cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. J Natl Cancer Inst. 1993;85:365–76. http://www.ncbi.nlm.nih.gov/pubmed/8433390

[155] World Health Organization. WHOQOL User Manual - Programme on mental health 2012 https://www.who.int/tools/whoqol

[156] Lee LJ, Kwon CS, Forsythe A, et al. Humanistic and Economic Burden of Non-Muscle Invasive Bladder Cancer: Results of Two Systematic Literature Reviews. Clinicoecon Outcomes Res. 2020;12:693–709. https://pubmed.ncbi.nlm.nih.gov/33262624/

[157] Vaioulis A, Bonotis K, Perivoliotis K, et al. Quality of Life and Anxiety in Patients with First Diagnosed Non-Muscle Invasive Bladder Cancer Who Receive Adjuvant Bladder Therapy. Bladder Cancer. 2021;7:297–306. https://pubmed.ncbi.nlm.nih.gov/38993613/

[158] Siracusano S, Silvestri T, Bassi S, et al. Health-related quality of life after BCG or MMC induction for non-muscle invasive bladder cancer. Can J Urol. 2018;25:9480–5. https://pubmed.ncbi.nlm.nih.gov/30281005/

[159] Yuen JW, Wu RW, Ching SS, et al. Impact of Effective Intravesical Therapies on Quality of Life in Patients with Non-Muscle Invasive Bladder Cancer: A Systematic Review. Int J Environ Res Public Health. 2022;19. https://pubmed.ncbi.nlm.nih.gov/36078542/

[160] van Straten C, Caris C, Grimm MO, et al. Quality of Life in Patients with High-grade Non-muscle-invasive Bladder Cancer Undergoing Standard Versus Reduced Frequency of Bacillus Calmette-Guérin Instillations: The EAU-RF NIMBUS Trial. Eur Urol Open Sci. 2023;56:15–24. https://pubmed.ncbi.nlm.nih.gov/37822514/

[161] Grabe-Heyne K, Henne C, Mariappan P, et al. Intermediate and high-risk non-muscle-invasive bladder cancer: an overview of epidemiology, burden, and unmet needs. Front Oncol. 2023;13:1170124. https://pubmed.ncbi.nlm.nih.gov/37333804/

[162] Beeren I, Klerks NE, Aben KK, Oddens JR, Witjes JA, Kiemeney LA, et al. Health-related Quality of Life During the First 4 Years After Non-Muscle-invasive Bladder Cancer Diagnosis: Results of a Large Multicentre Prospective Cohort. Eur Urol Oncol. 2024;7:829–37. https://pubmed.ncbi.nlm.nih.gov/37996278/

[163] Koga H, Ozono S, Tsushima T, Tomita K, et al. Maintenance intravesical bacillus Calmette-Guérin instillation for Ta, T1 cancer and carcinoma in situ of the bladder: randomized controlled trial by the BCG Tokyo Strain Study Group. Int J Urol. 2010;17:759–66. http://www.ncbi.nlm.nih.gov/pubmed/20604814

[164] Beeren I, Koops C, van der Heijden AG, et al. Lifestyle Advice to Patients with Bladder Cancer: A National Survey of Dutch Urologists. Bladder Cancer. 2024;10:215–20. https://pubmed.ncbi.nlm.nih.gov/39493821/

[165] Sandager M, Freil, M, Knudsen JL. Please tick the appropriate box: perspectives on patient reported experience. Patient Exp J. 2016;3 (1):63–79. https://pxjournal.org/journal/vol3/iss1/10/

[166] Myers A, Ristau B, Mossanen M, et al. Patient reported treatment burden and attitudes towards in-home intravesical therapy among patients with bladder cancer. Urol Oncol. 2024;42:29.e17–29.e2.
https://pubmed.ncbi.nlm.nih.gov/37993341/

[167] Rutherford C, Costa DSJ, King MT, et al. A conceptual framework for patient-reported outcomes in non-muscle invasive bladder cancer. Support Care Cancer. 2017;25:3095–102.
https://pubmed.ncbi.nlm.nih.gov/28451912/

[168] Alcorn J, Burton R, Topping A. Withdrawing from treatment for Bladder cancer: Patient experiences of BCG installations. Int J Urol Nurs. 2020;14.
https://onlinelibrary.wiley.com/doi/abs/10.1111/ijun.12236

[169] Chung J, Kulkarni GS, Morash R, et al. Assessment of quality of life, information, and supportive care needs in patients with muscle and non-muscle invasive bladder cancer across the illness trajectory. Support Care Cancer. 2019;27:3877–85.
https://pubmed.ncbi.nlm.nih.gov/30767131/

[170] Miyake M, Nishimura N, Oda Y, et al. Intravesical Bacillus Calmette-Guerin treatment-induced sleep quality deterioration in patients with non-muscle invasive bladder cancer: functional outcome assessment based on a questionnaire survey and actigraphy. Support Care Cancer. 2022;30:887–95.
https://pubmed.ncbi.nlm.nih.gov/34398288/

16. Conflict of interest

All members of the EAUN guidelines working group have provided disclosure statements of all relationships that they have that might be perceived as a potential source of a conflict of interest. This information is available from the EAUN Central Office by emailing eaun@uroweb.org.

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Appendix 1

Search strategies

Database: EBM Reviews - Cochrane Central Register of Controlled Trials <May 2024>, EBM Reviews - Cochrane Database of Systematic Reviews <2005 to June 5, 2024>, Embase <1974 to 2024 June 11>, Ovid MEDLINE(R) ALL <1946 to June 11, 2024>

Search Strategy:

1 exp non muscle invasive bladder cancer/ (7303)
2 exp bladder tumor/ or exp Urinary Bladder Neoplasms/ or exp bladder cancer/ or exp bladder carcinoma/ (179085)
3 ((bladder or vesical) adj3 (cancer* or carcin* or malig* or tumor* or tumour* or neoplas* or papilloma)).tw,kw,kf. (170022)
4 exp *transitional cell carcinoma/ (40606)
5 or/2-4 (232514)
6 ((non-muscle or nonmuscle or non muscle) adj3 invasive*).tw,kw,kw. (15590)
7 exp carcinoma in situ/ (84704)
8 ((urothelial or urothelium) adj3 (cancer or carcin* or neoplas* or tumor* or tumour* or maglin* or papilloma)).tw,kw,kf. (54480)
9 ((low risk or superficial or early) adj3 (cancer or carcin* or neoplas* or tumor* or tumour* or maglin* or papilloma)).tw,kw,kf. (254674)
10 (NMIBC or (non adj2 invasive) or “carcinoma in situ”).tw,kw,kf. (405724)
11 ((Ta or T1 or TIS or Ta -T1 or G1 or G2 or G3 or G1-G2 or G1-2) adj3 (cancer or carcin* or neoplas* or tumor* or tumour* or maglin* or papilloma)).tw,kw,kf. (37244)
12 ((low grade or high grade) adj3 (cancer or carcin* or neoplas* or tumor* or tumour* or maglin* or papilloma)).tw,kw,kf. (85415)
13 or/6-12 (844890)
14 5 and 13 (76116)
15 1 or 14 (76900)
16 exp Mitomycins/ (44744)
17 exp Mitomycin/ (40205)
18 exp mitomycin C/ (40205)
19 mitomycin*.tw,kw,kf. (45047)
20 exp BCG Vaccine/ (58396)
21 (BCG or (bacillus adj2 calmette adj2 guerin)).tw,kw,kf. (64411)
22 or/16-21 (150440)
23 15 and 22 (14130)
24 exp bladder irrigation/ (2983)

25 Therapeutic irrigation/ (35839)
26 exp intravesical drug administration/ (8800)
27 exp Administration, Intravesical/ (8800)
28 (intravesical or instillat* or installation or irrigation or flushing).tw,kw,kf. (232492)
29 or/24-28 (258409)
30 23 and 29 (10025)
31 (bladder and (cancer* or carcinoma*) and (intravesical or instillation)).ti. (5342)
32 30 or 31 (11999)
33 limit 32 to yr="2014 -Current" (5765)
34 (exp animals/ or exp animal/) not (humans/ or human/) (10644652)
35 ((rat or rats or mice or mouse or swine or porcine or murine or sheep or lambs or pigs or piglets or rabbit or rabbits or cat or cats or dog or dogs or cattle or bovine or monkey or monkeys or trout or marmoset$1 or basic research or cell lines or in vitro or animal model or canine) not (human* or men or women or patients)).tw. (8197842)
36 33 not (34 or 35) (5496)
37 (child/ or Pediatrics/ or Adolescent/ or Infant/ or adolescence/ or newborn/) not (adult/ or aged/) (4784488)
38 ((baby or babies or child or children or pediatric* or paediatric* or peadiatric* or infant* or infancy or neonat* or newborn* or new born* or adolescen* or toddler*) not (adult* or elder* or senior* or men or women)).tw. (4721753)
39 36 not (37 or 38) (5466)
40 (conference abstract or Conference Review).pt. (5195658)
41 39 not 40 (4238)
42 note/ or editorial/ or letter/ or Comment/ or news/ or (note or editorial or letter or Comment or news).pt. (5648774)
43 41 not 42 (3963)
44 case report/ or case reports/ or (case report or a case or a rare case).ti. (5915741)
45 43 not 44 (3457)
46 limit 45 to dc=20141121-20240611 use oemezd [Limit not valid in CCTR,CDSR; records were retained] (1472)
47 limit 45 to dd=20141121-20240611 use oemezd [Limit not valid in CCTR,CDSR,Ovid MEDLINE(R); records were retained] (164)
48 limit 45 to ed=20141121-20240611 use medall [Limit not valid in CCTR,CDSR,Embase; records were retained] (1130)
49 limit 45 to ez=20141121-20240611 use medall [Limit not valid in CCTR,CDSR,Embase; records were retained] (1357)
50 limit 45 to dt=20141121-20240611 use medall [Limit not valid in CCTR,CDSR,Embase; records were retained] (1358)

51 limit 45 to yr="2014-2024" use cctr (463)
52 limit 45 to yr="2014 - 2024" use coch (5)
53 45 and (2015* or 2016* or 2017* or 2018* or 2018* or 2020* or 2021* or 2022* or 2023* or 2024*).ep. (1003)
54 or/46-53 (3353)
55 limit 54 to english language [Limit not valid in CDSR; records were retained] (3159)
56 remove duplicates from 55 (1922)

Appendix 2

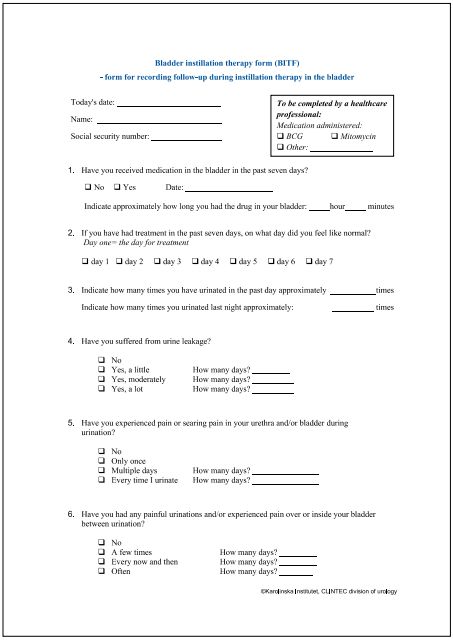
Checklist for patient information

- Most common side effects associated with BCG
- Most common side effects associated with MMC
- Medications to avoid/delay prior to instillation visit:
    - Antibiotics
    - Diuretics
- Fluid intake management
- Voiding post-procedure
- Irritative symptoms of the urinary tract may be due to cystitis or UTI. Instruct the patient on the signs and symptoms of a UTI.
    - Burning on urination
    - Frequency/urgency
    - Painful voiding
    - Foul smelling urine
    - Cloudy/dark urine
    - Fever and/or chills
    - Haematuria
- Laundering of contaminated clothing
- Resuming normal activity, including health maintenance, diet and exercise
- Sexual activity

Appendix 3

Example of side effects questionnaire

This Bladder Instillation Therapy Form (BITF) was developed by Gun Danielsson [149]. The form can be downloaded from the article in Swedish and English under Supporting Information.



Bladder instillation therapy form (BITF)

- form for recording follow-up during instillation therapy in the bladder

Today's date: _____

Name: _____

Social security number: _____

To be completed by a healthcare professional:
Medication administered:
❑ *BCG* ❑ *Mitomycin*
❑ *Other:* _____

1. Have you received medication in the bladder in the past seven days?

❑ No ❑ Yes Date: _____

Indicate approximately how long you had the drug in your bladder: ____hour____ minutes

2. If you have had treatment in the past seven days, on what day did you feel like normal?
Day one= the day for treatment

❑ day 1 ❑ day 2 ❑ day 3 ❑ day 4 ❑ day 5 ❑ day 6 ❑ day 7

3. Indicate how many times you have urinated in the past day approximately _____times

Indicate how many times you urinated last night approximately: _____times

4. Have you suffered from urine leukage?

❑ No
❑ Yes, a little How many days? _____
❑ Yes, moderately How many days? _____
❑ Yes, a lot How many days? _____

5. Have you experienced pain or searing pain in your urethra and/or bladder during urination?

❑ No
❑ Only once
❑ Multiple days How many days? _____
❑ Every time I urinate How many days? _____

6. Have you had any painful urinations and/or experienced pain over or inside your bladder between urination?

❑ No
❑ A few times How many days? _____
❑ Every now and then How many days? _____
❑ Often How many days? _____

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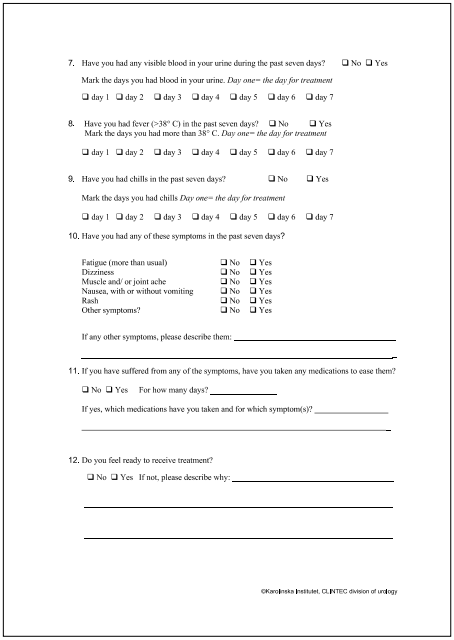

7. Have you had any visible blood in your urine during the past seven days? ❑ No ❑ Yes

Mark the days you had blood in your urine. *Day one= the day for treatment*

❑ day 1 ❑ day 2 ❑ day 3 ❑ day 4 ❑ day 5 ❑ day 6 ❑ day 7

8. Have you had fever (>38° C) in the past seven days? ❑ No ❑ Yes
Mark the days you had more than 38° C. *Day one= the day for treatment*

❑ day 1 ❑ day 2 ❑ day 3 ❑ day 4 ❑ day 5 ❑ day 6 ❑ day 7

9. Have you had chills in the past seven days? ❑ No ❑ Yes

Mark the days you had chills *Day one= the day for treatment*

❑ day 1 ❑ day 2 ❑ day 3 ❑ day 4 ❑ day 5 ❑ day 6 ❑ day 7

10. Have you had any of these symptoms in the past seven days?

Fatigue (more than usual)	❑ No	❑ Yes
Dizziness	❑ No	❑ Yes
Muscle and/ or joint ache	❑ No	❑ Yes
Nausea, with or without vomiting	❑ No	❑ Yes
Rash	❑ No	❑ Yes
Other symptoms?	❑ No	❑ Yes

If any other symptoms, please describe them: _____

_____

11. If you have suffered from any of the symptoms, have you taken any medications to ease them?

❑ No ❑ Yes For how many days? _____

If yes, which medications have you taken and for which symptom(s)? _____

_____

12. Do you feel ready to receive treatment?

❑ No ❑ Yes If not, please describe why: _____

_____

_____

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Appendix 4

Examples safety guidelines for handling hazardous drugs

Instructions for cleaning spills of liquid hazardous waste

- For information about the hazards of the spilled drug, contact the area pharmacy or use the pharmacy-sponsored Micromedex web page (micromedex.mc.duke.edu).
- Whenever possible, spills of liquid hazardous drugs will be handled by employees in the area of the spill.
- Employees may call 911 to contact OESO for telephone advice or assistance cleaning up the spill. OESO will respond to large spills that are beyond the capacity of employees in the vicinity of the spill.

Equipment needed:

Chemotherapy/hazardous drug spill kit (available from Pharmacy Storeroom at 681-5364), including:

- Protective gown or coveralls
- Shoe covers
- Splash goggles
- 2 pairs chemotherapy tested disposable gloves
- Absorbent pads
- Scoop with detachable scraper for collecting glass fragments
- 2 5-gallon plastic waste disposal bags
- One Ziploc bag for returning contaminated splash goggles to pharmacy
- Hazardous drug waste labels

1. Alert nearby persons about the spill.
2. If the spilled drug got on anyone's skin, eyes, or clothing, see supplemental info information below (*).
3. Prevent risk of additional skin contact with the spilled drug.
4. Obtain chemotherapy/hazardous drugs spill kit.
5. Put on safety goggles and double gloves from kit. If spill involves more than 5 mL or covers more than one square foot (or, for smaller spills, at the discretion of the person cleaning the spill), put on Tyvek gown and shoe covers (or coveralls) from kit. Tuck sleeves into the outer gloves.
6. If there are broken glass fragments, use the detachable scraper to carefully "sweep" them or other sharps into the scoop. Place these sharps in a needle box.
7. Use the absorbent pads to gently cover and wipe up the spilled material. If additional absorbent material is needed, use plastic lined blue pads (chux) or other available materials. Place used absorbent in one of the clear 5-gallon bags from the spill kit.

8. Clean the area thoroughly with water. Disposable materials used in this step should go into the open bag from the spill kit.
9. Clean the area three times using a detergent solution, then rinse. (Housekeeping can be called in for this step only.)
10. Place any contaminated hospital linens in a hospital laundry bag.
11. Place other (personal) contaminated clothing in a sealed plastic bag. If it will be laundered, double bag for transport, then wash twice before combining with other laundry. If it will be discarded, place it in the open bag from the spill kit.
12. Remove the shoe covers (if used) and outer pair of gloves. Place these into the open bag from the spill kit.
13. Remove the goggles and place them into the open bag from the spill kit. (Alternately, goggles may be washed and reused.)
14. Close the open waste bag (by knotting or using twist tie or tape), then place it into the second clear 5-gallon bag from the spill kit.
15. Remove the Tyvek gown (or coveralls) and inner gloves. Place these into the second bag from the spill kit. Close the outer bag.
16. Wash hands thoroughly.
17. Read carefully for proper waste disposal (Improper disposal can mean large fines).

Nursing & Medical Research: If the drug is listed below, determine a location where the bag can be left for a few days without being moved or thrown in the trash. Contact the Occupational and Environmental Safety Office (OESO) at 684-2794 to arrange for waste pick-up. Be prepared to give the name of the drug, location of the waste bag, and the name and telephone number for a responsible person who will be available during business hours. Fill in the blanks on the "Hazardous Drug Waste" labels and put them on the bag, then put bag in location described to OESO.

<u>These are the drugs that must be treated as described above:</u>

- Chlorambucil (Leukeran)
- Cyclophosphamide (Cytoxin)
- Daunorubicin (Daunomycin, Cerubidine)
- Melphalan (Alkeran)
- Mitomycin (Mitomycin C, Mutamycin)
- Streptozocin (Zanosar, Streptozotocin)
- Uracil mustard (Uramustine, U-8344)
- Arsenic Trioxide
- Diethylstilbestrol

If the drug is not on the above list, put the knotted bag of spill waste directly into a biohazard container (WITHOUT labels). Call the Pharmacy Storeroom at 681-5364 to

obtain a replacement chemotherapy/ hazardous drug spill kit. Nursing staff should bag and label any contaminated pumps and send to Pharmacy. Follow reporting procedures in the supplemental info below(**).

Supplemental Information for Employees Cleaning up Spills of Hazardous Drugs
**Obvious contamination of gloves, clothing, skin or eyes will be treated as follows:*

a) Remove contaminated gloves or clothing (if applicable).
b) Wash the affected skin area with soap (not germicidal cleaner) and lukewarm water. For eye exposure, immediately flush the affected eye with water or isotonic eyewash (or normal saline) for at least 15 minutes.
c) For direct skin or eye contact:
   - Obtain medical attention as soon as possible. Employees should go to Employee Occupational Health and Wellness or the Emergency Dept.
   - Fill out the appropriate incident report form and submit as follows:
     - Employees who are exposed must fill out a Report of Work-Related Injury/ Illness and send to Employee Health.
     - If patient injury occurs, notify Pharmacy Quality Improvement (pager 970-2494) and Risk Management (pager 970-2404) immediately.
     - If a visitor is exposed, notify Risk Management.
   - Inform the appropriate area manager.

***Reporting Requirements for ALL Incidents During Patient Treatment:*
Any drug spill during patient treatment should be documented in the Safety Reporting System.

About these instructions and when they should be used:
These instructions are provided with hazardous drugs spill kits so that, whenever possible, spills of LIQUID hazardous drugs can be handled by employees in the area of the spill. Hazardous drugs are those marked “Chemotherapy” or “Hazardous drug” by the pharmacy.

Additional Information:
- For information about the hazards of the spilled drug, contact the area pharmacy or use the Pharmacy-sponsored Micromedex web page. Ask for or look for a Material Safety Data Sheet (MSDS) on the drug.
- It is not necessary to report hazardous drug spills to the Occupational and Environmental Safety Office (OESO) unless hazardous waste pickup is required. However, employees may call 911 to contact OESO for telephone advice or assistance cleaning up the spill. **OESO will respond to large spills that are beyond the capacity of employees in the vicinity of the spill**. If you call 911, tell the dispatcher there

is a hazardous drug spill and give a number where you or someone else in your work area can be reached. Please make sure someone is available to answer the telephone and talk with the Spill Responder from OESO.

Hazardous drug spill training is available through OESO's training website.

If you have questions or comments regarding this publication, please contact:
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6803 AA Arnhem -The Netherlands
E-mail: eaun@uroweb.org
You can also visit the EAUN website: www.eaun.org

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