BC Centre for Palliative Care

B.C. INTER-PROFESSIONAL PALLIATIVE SYMPTOM MANAGEMENT GUIDELINES

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Interior Health
Every person matters

First Nations Health Authority
Health through wellness

island health

Providence
HEALTH CARE

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COUGH

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DEFINITION

Cough is an important physiological reflex to prevent foreign material entering the lower respiratory tract; it helps to clear excess secretions, microbes and other substances[1-4] from the lungs and bronchial tree[2, 5] when muco-ciliary transport is insufficient.[6] Coughing occurs as an explosive expiration that can be a conscious act or a reflex response to an irritation of the tracheobronchial tree.[7, 8] It is also a contributing factor in the spread of infectious disease.[2]

- **Acute cough** usually lasts less than 3 weeks,[9-11] but can last up to 8 weeks.[2]
- **Chronic cough** lasts more than 8 weeks and is attributed to distinct malignant and non-malignant diseases.[2, 3, 7-10, 12] Cough is abnormal when it is ineffective, interferes with quality of life, and causes other symptoms.[13]
- **Dry cough** occurs when no sputum is produced.[7, 8, 11]
- **Productive cough** occurs when sputum is produced.[7, 8] Sputum may contain clear secretions, mucous, pus, blood, bronchial casts, or other foreign material.

PREVALENCE

Chronic cough is most common in lung cancer (up to 86%),[14, 15] cancers of the head and neck (over 90%),[6] and other advanced cancers (up to 40%).[14, 15] It is also very common in advanced chronic diseases,[6] especially chronic obstructive pulmonary disease (COPD) (up to 70%),[16-21] and interstitial pulmonary fibrosis (up to 80%).[22-24] Cough is significantly more prevalent in smokers[21] and affects many of those with late stage organ failure (brain, heart, kidney, liver),[25] asthma, and HIV infection.[8, 26, 27] In lung cancer patients, up to 48% reported moderate to severe cough intensity.[28] Considering that up to 86% of patients living with, and dying from, advanced illness experience distressing cough,[15, 29, 30] greater attention is required.

IMPACT

Chronic cough can have profound physical and psychosocial impacts on quality of life for both patients and caregivers/family,[6, 9, 31] yet it is often undertreated.[32] Cough interferes with sleep, oral intake,[12, 33] provokes discomfort,[3] and leads to physical exhaustion. It may worsen existing symptoms such as pain, dyspnea, nausea and vomiting,[12] depression,[34, 35] and incontinence.[12, 33, 36, 37] Cough may also cause new problems, such as rib fractures,[36, 38, 39] or lead to life-threatening complications.[40-42]

Chronic cough is embarrassing for patients, interrupts conversation, stresses relationships and leads to social isolation. Families and friends may find it difficult to tolerate the repetitive noise,[3, 33, 37, 38] adding to existing burdens. Cachexia and generalized weakness, common near end-of-life, may make coughing more exhausting and less effective.[6, 29, 36]

STANDARD OF CARE

Step 1 | Goals of care conversation

Determine goals of care in conversation with the patient, family and inter-disciplinary team. Refer to additional resources (Additional resources for management of cough) for tools to guide conversations and required documentation. Goals of care may change over time and need to be reconsidered at times of transition, e.g., disease progression or transfer to another care setting.

Step 2 | Assessment

Ongoing comprehensive assessment is the foundation of effective cough management, including interview (**see** Cough management algorithm). Use both objective and subjective measures.[11, 43] Cough assessment determines the cause, triggers, impact on quality of life, and effectiveness of treatments.[1, 5, 29, 30, 44-47]

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Cough Assessment: Using Mnemonic O, P, Q, R, S, T, U and V[1]

Mnemonic Letter	**Assessment Questions** *Whenever possible, ask the patient directly. Involve family as appropriate and desired by the patient.*
Onset	When did it begin? How long does it last? How often does it occur?
Provoking /Palliating	What triggers your cough? What makes it better? What makes it worse? Is it worse in the morning, after a meal, at night? Smoking history/environmental exposures? Is it positional? Can you talk on the phone? Eat? Drink?
Quality	What does it feel like? Can you describe it? Sputum? If yes, what colour/amount/frequency? Does if contain any blood? Does it affect your voice? Cause anxiety?
Region/Radiation	Does it feel like it is coming from your chest or throat?
Severity	How severe is this symptom? What would you rate it on a scale of 0-10 (0 being none and 10 being the worst possible)? Right now? At worst? On average? How bothered are you by this symptom? Are there any other symptom(s) that accompany this symptom? (e.g., pain, shortness of breath)? Does your cough affect these? Do you have chills/fever/joint pain? Wheezing? Night sweats/weight loss? Allergies? Reflux?
Treatment	What medications and treatments are you currently using? Are you using any non-prescription treatments, herbal remedies, or traditional healing practices? How effective are these? Do you have any side effects from the medications and treatments? What have you tried in the past? Do you have concerns about side effects or cost of treatments?
Understanding	What do you believe is causing this symptom? How is it affecting you and/or your family? What is most concerning to you?
Values	What overall goals do we need to keep in mind as we manage this symptom? What is your acceptable level for this symptom (0-10)? Are there any beliefs, views or feelings about this symptom that are important to you and your family?

Symptom Assessment: Physical assessment as appropriate for symptom

Complete history and physical assessment, including oral exam (**see** Cough management algorithm). Review medication, medical/surgical conditions, psychosocial and physical environment, including past/present occupation.[10, 21, 53] Identifying the underlying etiology of the cough is essential in determining the treatment required.[1, 5, 6, 29, 30, 45, 47, 48, 54-57]

Diagnostics: consider goals of care before ordering diagnostic testing

- Include chest x-ray,[7, 8, 10, 21, 56, 57] CBC, pulse oximetry,[37] and CT scan.[2, 10]

Step 3 | **Determine possible causes and reverse as possible if in keeping with goals of care** (For more details, see Underlying Causes of Cough in Palliative Care)

In almost all cases, cough is a complication of the primary pathology, but unrelated causes should not be automatically excluded.[3, 10] Chronic cough in the palliative population is usually due to multiple pathological mechanisms which are both cancer related and non-cancer.[6, 37, 53] (**See** Underlying causes of cough in palliative care **for more information**). Cough may be triggered by a wide variety of chemical (e.g., smoke), inflammatory (e.g., histamine), and mechanical (e.g., sputum or thrush) stimuli,[51, 58] producing a cascade of symptom effects.[7, 49]

PRINCIPLES OF MANAGEMENT

When considering a management approach, always balance burden of a possible intervention against the likely benefit (e.g., does the intervention require transfer to another care setting?)

- Identify and immediately treat reversible underlying causes (Underlying causes of cough in palliative care **and** cough extra resources or assessment tools) if possible and appropriate.[6, 12, 50, 56] Often acute cough episodes may be effectively managed.[55]

- Eliminate/reduce triggers to minimize risk of aggravating cough.[6,10, 51]
- Start symptomatic treatment for any distressing cough whether waiting for acute treatments to work or when cough is irreversible.[2, 6, 10]
- Use multiple concurrent therapies to control intractable coughing.[3]
- Involvement of the multi-disciplinary team is essential to support patient/family coping.[3, 9]
- The burdens of cough are significant to patients yet shown to be poorly supported.[49]
- Settle productive cough in dying patients.[6, 29]

Step 4 | **Interventions**

LEGEND FOR USE OF BULLETS

Bullets are used to identify the type or strength of recommendation that is being made, based on a review of available evidence, using a modified GRADE process.

	**Use with confidence:** recommendations are supported by moderate to high levels of empirical evidence.
	**Use if benefits outweigh potential harm:** recommendations are supported by clinical practice experience, anecdotal, observational or case study evidence providing low level empirical evidence.
	**Use with caution:** Evidence for recommendations is conflicting or insufficient, requiring further study
	**Not recommended:** high level empirical evidence of no benefit or potential harm

Non-pharmacological interventions

Interventions available in the home and residential care facilities

It may be possible to manage cough in the home or residential care facility with appropriate planning and support for the patient, family and staff; all of these interventions do not necessarily require additional equipment or admission to acute care.

For Dry Cough

- **Speech therapy strategies**:[32] pursed lip breathing, replace cough with swallow, relaxed throat breath, cough suppression education,[59] and distraction.[67, 68]
- **Nebulized saline**,[3, 9, 65, 66] **steam, or cold air humidifier**[5, 7, 8, 17, 29, 46-48] reduces dryness and irritation of airways. Ensure adequate hydration.[30] Avoid fluid overload.

For Productive Cough

- Use **airway clearance therapies** (ACTs) as appropriate for condition; these include: active cycle of breathing technique (ACBT), autogenic drainage,[69] and forced expiration to remove secretions. Passive techniques include chest physiotherapy[3, 21] and postural drainage,[1, 5, 21, 29, 30, 44, 46, 48, 60] which is not to be used during acute exacerbation of chronic bronchitis.[1]
- **Nebulized saline** reduces viscosity of thick or purulent secretions to aid expectoration.[37,62,63]
- Suction is usually not indicated except for patients with: tracheostomy, complete esophageal obstruction preventing saliva swallow, bleeding in mouth or throat (use with caution so as not to make it worse), acute fulminant pulmonary edema,[29, 46] or massively secreting bronchogenic tumour.[21]

Pharmacological interventions
Direct drug treatment to identified causes
(see Underlying causes of cough in palliative care)

Mild Cough

Continue non-pharmacological interventions when beneficial

Dry

- Demulcents: to soothe irritation, use local anesthetic lozenges or a sweet syrup called 'simple syrup', a mixture of sugar and water, obtained from a pharmacy.[2, 7, 13, 14, 36, 70-72]
- Dextromethorphan[7, 14, 36, 71, 73] has variable benefit.[6]

Productive

- Expectorants: Guaifenesin to liquefy viscous mucous and promote expulsion.[2, 13, 37]

Moderate to Severe Cough

Continue non-pharmacological interventions

Dry - demulcents when beneficial

- Morphine:[17, 36, 50, 72, 74] start low (e.g., 2.5 to 5 mg IR PO Q4-6H).[6, 9, 72, 74]
  - ⚠ Review of other opioids reveal no demonstrated superiority over morphine.[59, 72]
- Opioids such as HYDROcodone and HYDROmorphone also provide cough suppression.[28]
  - ☒ **Avoid use of codeine:** benefit no greater than placebo.[75-77] A prior standard of treatment but is now considered either ineffective or provides a highly variable benefit.[36, 78-80,81] Morphine preferred as it is unaffected by pharmacogenomic CYP2D6-dependent metabolism.[6, 74, 82]

- Consult palliative specialist if results unsatisfactory. Further options may include nebulized lidocaine when cough is refractory[41, 72, 78, 83, 84] to add peripheral action to morphine central effects.[37, 71, 72] Otherwise use methadone or gabapentin.[14, 21, 70-72, 85]

Productive - may require anticholinergics such as glycopyrrolate or scopolamine at end-of-life.[4, 10, 14, 86]

(See Respiratory Congestion guideline for more information.)

Management

- Expect maximal morphine benefit within 5 days and, when effective, cough suppression is maintained.[74]
- Titrate drug doses up to effect/tolerable/maximum doses (Medications for management of cough).
    - Once established on morphine, to further decrease coughing, trial additional PRN doses,[9] or an increase of 20-50% of the regularly scheduled morphine dose.[3, 6]
- Treat other ***existing*** symptoms worsened by, ***or resulting from,*** chronic coughing. Prolonged coughing can cascade into aggravating anxiety, shortness of breath, and fatigue.[10, 49, 87]
    - Night time cough management is especially important to provide restful sleep.[7] Aim to settle cough with drugs before bedtime; give sufficiently early for onset to work.
    - Dry night cough is common. Just laying down is reported to often trigger coughing.[49]

Patient and family education

- Provide information regarding the etiology of cough, expectations of treatment, and practical advice to enhance patient and family coping ability.[29, 59] Discuss fears; acknowledge anxieties.[9]
- Teach patient and family to develop a self-management plan which may include:
  - Eliminating environmental irritants[59] and supporting options for smoking cessation, when applicable.[1, 30, 46, 54, 60, 61]
  - Improving ventilation: open window; use a fan[9]; use humidification.[7]
  - Using positioning, posture, relaxation and anxiety reduction techniques.[1, 3, 9]
- Encourage forced expiratory "huffing" to clear secretions[1, 48, 62, 63] and controlled breathing techniques to reduce cough.[3, 9, 59]
- Proper use of medication; value of response monitoring with cough diary.[7]
- If hemoptysis/risk of massive bleeding, see Severe Bleeding guideline for more information.

ADDITIONAL RESOURCES FOR MANAGEMENT OF COUGH

Resources specific to cough

- Airway clearance techniques
  - ➡ https://www.cff.org/Life-With-CF/Treatments-and-Therapies/Airway-Clearance/Airway-Clearance-Techniques/

General Resources

- **Provincial Palliative Care Line** – for **physician** advice or support, call **1 877 711-5757** In ongoing partnership with the Doctors of BC, the toll-free Provincial Palliative Care Consultation Phone Line is staffed by Vancouver Home Hospice Palliative Care physicians 24 hours per day, 7 days per week to assist physicians in B.C. with advice about symptom management, psychosocial issues, or difficult end-of-life decision making.
- BC Centre for Palliative Care: Serious Illness Conversation Guide
  - ➞ https://www.bc-cpc.ca/cpc/serious-illness-conversations/
- BC Guidelines: Palliative Care for the Patient with Incurable Cancer or Advanced Disease
  - ➞ http://www2.gov.bc.ca/gov/content/health/practitioner-professional-resources/bc-guidelines/palliative-care
- BC Palliative Care Benefits: Information for prescribers
  - ➞ https://www2.gov.bc.ca/gov/content/health/practitioner-professional-resources/pharmacare/prescribers/plan-p-bc-palliative-care-benefits-program
- National Centre for Complementary and Alternative Medicine (NCCAM) for additional information on the use of non-pharmacological interventions
  - ➞ https://nccih.nih.gov/
- Canadian Association of Psychosocial Oncology: Algorithms for Cancer-related Distress, Depression and Global Anxiety
  - ➞ https://www.capo.ca/resources/Documents/Guidelines/4.%20Algorithms%20for%20Cancer-related%20Distress,%20Depression%20and%20Global%20Anxiety.pdf
- Fraser Health psychosocial care guideline
  - ➞ https://www.fraserhealth.ca/employees/clinical-resources/hospice-palliative-care#.W-by_pNKg2w

Resources specific to health organization/region

- Fraser Health
  - ➞ https://www.fraserhealth.ca/employees/clinical-resources/hospice-palliative-care#.XDU8UFVKjb1

- First Nations Health Authority
  - ➞ http://www.fnha.ca/
- Interior Health
  - ➞ https://www.interiorhealth.ca/YourCare/PalliativeCare/Pages/default.aspx
- Island Health
  - ➞ https://www.islandhealth.ca/our-services/end-of-life-hospice-palliative-services/hospice-palliative-end-of-life-care
- Northern Health
  - ➞ https://www.northernhealth.ca/for-health-professionals/palliative-care-end-life-care
- Providence Health
  - ➞ http://hpc.providencehealthcare.org/
- Vancouver Coastal Health
  - ➞ http://www.vch.ca/your-care/home-community-care/care-options/hospice-palliative-care

Resources specific to patient population

- ALS Society of Canada: A Guide to ALS patient care for primary care physicians
  - ➞ https://als.ca/wp-content/uploads/2017/02/A-Guide-to-ALS-Patient-Care-For-Primary-Care-Physicians-English.pdf
- ALS Society of British Columbia 1-800-708-3228
  - ➞ www.alsbc.ca
- BC Cancer Agency: Symptom management guidelines
  - ➞ http://www.bccancer.bc.ca/health-professionals/clinical-resources/nursing/symptom-management
- BC Renal Agency: Conservative care pathway and symptom management
  - ➞ http://www.bcrenalagency.ca/health-professionals/clinical-resources/palliative-care

- BC's Heart Failure Network: Clinical practice guidelines for heart failure symptom management
  - ➡ http://www.bcheartfailure.ca/for-bc-healthcare-providers/end-of-life-tools/
- Canuck Place Children's Hospice
  - ➡ https://www.canuckplace.org/resources/for-health-professionals/
    - 24 hr line – 1.877.882.2288
    - Page a Pediatric Palliative care physician – 1-604-875-2161 (request palliative physician on call)
- Together for short lives: Basic symptom control in pediatric palliative care
  - ➡ http://www.togetherforshortlives.org.uk/professionals/resources/2434_basic_symptom_control_in_paediatric_palliative_care_free_download

UNDERLYING CAUSES OF COUGH IN PALLIATIVE CARE[1, 42, 53, 88-90]

1. Cancer State	
Directly caused by primary or secondary cancer	
• Airway obstruction by tumour	• Pleural tumor (primary or metastasis)
• Lymphangitis carcinomatosis	• Pulmonary parenchymal involvement
• Multiple tumour microemboli	• Pulmonary leukostasis
• Malignant pleural effusion	• Superior vena cava syndrome
Indirectly caused by cancer	
• Anorexia-Cachexia syndrome	• Paraneoplastic syndrome
• Chemotherapy induced	• Pulmonary aspiration
• Chemotherapy induced cardiomyopathy (e.g., Doxorubicin)	• Acute pulmonary embolism**[91]
	• Radiotherapy lung damage
2. Non-Cancer State	
Immuno-compromised	***Neuromuscular pathology*** † (applies to all NMP)
• Prolonged neutropenia	• Amyotrophic lateral sclerosis (ALS)

Underlying causes of cough in palliative care continued on next page

UNDERLYING CAUSES OF COUGH *CONTINUED*

• HIV with CD4 count less than 200 cells/L	• Cerebral vascular disease (CVA)

• End stage weakness
  • heart failure (CHF)
  • kidney failure (CRF)
  • respiratory failure (COPD or fibrosis)
	• Hereditary ataxia
	• Late stage dementia (any type)
	• Muscular Sclerosis (MS)
	† If dysphagia, refer to Dysphagia guidelines

3. Unrelated to Primary Disease[41]	
• **Asthma**	• **Gastroesophageal reflux disease (GERD)**
• Bronchiectasis • Chronic bronchitis/**bronchospasm**	• Upper airway cough syndrome • (non-infectious, rhinosinus **post-nasal drip**)
• **Infection –** pneumonia, candidiasis (bacterial/fungal)	• **Sleep Apnea[2]**
4. Iatrogenic - Medications	
Drug Classes	**Specific Causative Examples***
• ACE Inhibitors	7 to 15% including Ramipril, Captopril, Perindopril, others
• Anticonvulsants	Clobazam 3-7%, Gabapentin 1.8%, Levetiracetam 2-9%
• Antidepressants	Duloxetine 3%
• Antiretrovirals	Lamivudine 18%, Ritonavir 21.7%
• Antihypertensives	Carvedilol 5-8%, Diltiazem 2%, Felodipine 0.8-1.7%, Losartan 17-29% (in hypertensive patients who had already experienced cough while receiving ACE-inhibitor therapy), Telmisartan 1.6-15.6%
• Antipsychotics	Aripiprazole 3%, Olanzapine 6%, Quetiapine 3%, Risperidone 2%

Underlying causes of cough in palliative care continued on next page

UNDERLYING CAUSES OF COUGH *CONTINUED*

• Chemotherapy	Abiraterone 10.6-17.3%, Bevacizumab 26-30%, Bleomycin, Busulfan 28% IV, Erlotinib 16-48%, Gefitinib, Letrozole 5-13%, Methotrexate, Sunitinib 27% (renal cell carcinoma), Temozolomide 5%, Trastuzumab 26-43% (metastatic breast cancer)
• Inhalational agents	Ipratropium, Salbutamol, Corticosteroids
• Opioids	Fentanyl 1%, Oxycodone 1-5%
• Other	Amiloride greater than 1% to less than 3%, Celecoxib < 2%, Diclofenac 4%, Ertapenem 1.3%, Everolimus 20-30% (tumors), 7% (Kidney transplant), Filgrastim 14% (myelosuppressive chemotherapy), Influximab 12%, Granisetron 2.2%, Memantine 4%, Midazolam 1.3%, Oxybutynin 1-5%, Pamidronate up to 25.7%, Pancrelipase 6-10%, Pravastatin 1.2-8.2%, Sibutramine 3.8%, Tamsulosin 3.4-4.5%, Testosterone < 3%, Ursodiol 7.1%, , Zoledronic acid 12% (hypocalcemia of malignancy), 22% (bone metastasis).

* There are many medications that are reported to cause cough.[92] This table provides some examples. Consult pharmacist if additional assistance is required.

** Up to 50% of patients with pulmonary embolism present with a cough.[2]

Bolded – identifies the causes of cough that are most reversible or treatable.[9, 93]

MEDICATIONS FOR MANAGEMENT OF COUGH

Drug (classification)	Dose, Therapeutic Range	Onset, Adverse Effects, Precautions and Dosing Concerns
Simple Syrup **(for dry cough)**	10 mL PO Q2 to 4 H[86]	Safe for use;[36] contents are sugar and water. Monitor use in diabetics. Effectiveness may be limited to time of contact, 20 to 30 minutes.[2] Mechanism of action unknown.[9] Sugar content may reduce cough reflex by increasing saliva production, swallowing,[7] and may act as a protective barrier to sensory receptors in the throat.[7, 70]
GuaiFENesin **(for wet cough)**	200 to 400 mg PO Q4H[10, 70, 72, 99] Maximum daily dose: 2400 mg[10]	**Adverse effects:** Gastric irritant, may rarely cause nausea and vomiting at higher doses.[4, 72] Urolithiasis, headache.[4] **Contraindicated:** Hypersensitivity to guaiFENesin products. **Precautions: Not for use for patients who are unable to cough**,[70, 72] e.g., neuromuscular disease such as amyotrophic lateral sclerosis.[6] Do not confuse with guanFACINE (different drug). Not for use in children younger than 6 years.[100]
Dextromethorphan **(for dry cough)**	15 to 30 mg PO Q4 to 8H [86] Maximum daily dose: 120 mg[3, 72, 86]	**Onset:** 15 to 30 minutes.[101] **Adverse effects:** Rash, hives, risk of serotonin syndrome.[102] Uncommon: nausea, drowsiness, vomiting, stomach discomfort, and constipation.[101] **Contraindicated:** Concurrent or within 14 days of monoamine oxidase inhibitor use.[102] **Precautions** with selective serotonin reuptake inhibitors or other medications for depression or Parkinson's disease, or for 2 weeks after stopping the medication. Not for use in children younger than 6 years.[100] Risk abuse, especially among adolescents, producing euphoria and hallucinations.[101] Metabolized by cytochrome P450 CYP2D6; monitor for potential drug interactions.[6, 72]

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MEDICATIONS FOR MANAGEMENT OF COUGH
CONTINUED

Drug (classification)	Dose, Therapeutic Range	Onset, Adverse Effects, Precautions and Dosing Concerns
Morphine † **(for dry cough)**	Starting dose: 2.5 to 5 mg PO Q4-6H	**Adverse effects:** Typical opioid side effects such as sedation, constipation, and nausea.[12] Assess for intolerance. **Contraindicated:** chronic cough due to bronchiectasis.[2] **Precautions:** Renal impairment. Do not normally use to manage cough due to known reversible causes.[72] **See** Underlying Causes of Cough in Palliative Care **and D** **Dosing:** Other routes of administration include IV, SC (reduce oral dose by half).[72] Sustained release morphine 10 mg Q12H reduced cough by 40%.[21, 74] When already on morphine, continue and use the existing immediate-release breakthrough analgesic dose (oral if able or subcutaneous equivalent) for the relief of cough. A maximum of 6 doses can be taken in 24 hours for all indications (pain, breathlessness and cough). Titrate both regular and breakthrough doses as required.[9]

Medications for management of cough continued on next page

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MEDICATIONS FOR MANAGEMENT OF COUGH
CONTINUED

Drug (classification)	Dose, Therapeutic Range	Onset, Adverse Effects, Precautions and Dosing Concerns
HYDROcodone (for dry cough)	Starting dose: Controlled release resin complex: 5 mL or one tablet every 8 to 12 hours Maximum daily dose: 10 mL or 2 tablets.[103]	**Adverse effects:** Constipation, drowsiness, nausea.[103] **Contraindicated:** Chronic cough due to bronchiectasis,[2] marked hypertension, patients receiving monoamine oxidase inhibitors, pre-existing respiratory depression, intra-cranial lesions with increased intracranial pressure.[103] **Precautions:** Use with hypnotics/sedatives.[103] Suspension must not be diluted with fluids or mixed with other drugs because this alters the resin-binding and changes the absorption rate.[103] **Dosing:** Product is a controlled-release resin complex **containing HYDROcodone 5 mg and an antihistamine phenyltoloxamine 10 mg per tablet or 5 mL.** The antihistamine may potentiate the antitussive effects of HYDROcodone. HYDROcodone has less antitussive activity than morphine,[28] but shown effective at 10mg/day.[21] HYDROcodone is significantly metabolized into 2 metabolites by cytochrome CYP2D6 (into HYDROmorphone) and CYP3A4 (into active norhydrocodone).[104] Cough suppression effectiveness and toxicity of HYDROcodone may be dependent[104] (unconfirmed) on CYP2D6 metabolism, and a switch to another opioid such as HYDROmorphone or morphine maybe preferred.[28, 82]

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MEDICATIONS FOR MANAGEMENT OF COUGH
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Drug (classification)	Dose, Therapeutic Range	Onset, Adverse Effects, Precautions and Dosing Concerns
HYDROmorphone (for dry cough)	Starting dose: 0.5 to 1 mg PO Q4H Dose Q6H if renal impairment	**Adverse effects:** Typical opioid side effects such as sedation, constipation, and nausea.[12] Assess for intolerance. **Contraindicated:** Chronic cough due to bronchiectasis.[2] **Precautions:** May accumulate in renal impairment, less so than morphine. **Dosing:** HYDROmorphone is not metabolized by CYP450 enzymes to any great extent[82].
Lidocaine 2% † Preservative free **(for dry cough)**	2 to 5 mL in 1 mL of normal saline Q4H **Nebulized**[53, 78] Maximum daily dose: 5 mL Q4H	**Adverse effects:** Well-tolerated, bitter taste, dysphonia, oropharyngeal numbness.[78] **Precautions: Keep NPO for at least 1 hour after use**[10, 72] to prevent aspiration risk. May precipitate bronchospasm in asthmatic patients.[53, 105] Monitor patients with hepatic disease for toxicity.[78] Use with oxygen; a standard pre-dose of salbutamol suggested in 1 case report to mitigate lidocaine-induced bronchospasm.[78] **Avoid inhalation of preservative containing formulations.** Use plain lidocaine sterile parenteral solutions to nebulize. **Dosing:** Rinse and spit after nebulization to minimize numbness of lips and tongue.[52] Use a mouthpiece rather than a mask for inhalation.[52] Bupivacine (0.25% 5 mL nebulized Q4H) has been suggested as an alternative and is also an amide local anesthetic.[52,41]

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MEDICATIONS FOR MANAGEMENT OF COUGH
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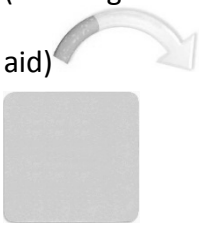
Drug (classification)	Dose, Therapeutic Range	Onset, Adverse Effects, Precautions and Dosing Concerns
Nicotine Patch (smoking cessation aid) 	Apply one patch every 24 hours. Select dose based on smoking use, e.g., 7, 14, 21 mg	**Adverse effects:** Skin irritation, sleep disturbance. **Precautions** in heart, thyroid, circulation or stomach problems, stroke or high blood pressure. For patients taking insulin or any prescription medications, consult physician.[106] **Dosing:** Assess potential for current drugs levels to increase after stopping cigarette smoking. Hydrocarbons in tobacco smoke induce CYP1A2 metabolism and smoking cessation may increase drug levels of drugs including: olanzapine, fluvoxamine, clozapine, propranolol, caffeine. As other smoking cessation products exist that may be more suitable, review with health care professional. Check patient eligibility for drug product coverage through the BC Smoking Cessation program.

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MEDICATIONS FOR MANAGEMENT OF COUGH
CONTINUED

Drug (classification)	Dose, Therapeutic Range	Onset, Adverse Effects, Precautions and Dosing Concerns
Dexamethasone **(Corticosteroid -anti-inflammatory)**	Dosing 2 to 16 mg daily, indication specific	**For indications:** non-asthmatic eosinophilic bronchitis, un-controlled asthma, stridor, tumor-related edema, chronic interstitial lung disease, lymphangitis, radiotherapy/chemotherapy induced pneumonitis carcinomatosis, or superior vena cava obstruction.[3, 6, 14, 21, 71, 107] **Adverse effects:** Candidiasis, fluid retention, gastritis, hypokalemia, hyperglycemia, myopathy, insomnia, impaired wound healing, psychosis.[9, 108, 109] After 6 weeks of use, greater risk of steroid-induced diabetes, proximal myopathy, lipodystrophy (moon face, buffalo hump), and after 3 months, of osteoporosis and glaucoma.[109] For symptomatic gastroprotection while on corticosteroids, if medical history suggests need, use a proton pump inhibitor such as pantoprazole or rabeprazole. **Contraindicated** when systemic infection, unless considered to be life-saving and specific anti-infective therapy is employed.[109] **Precautions:** Use in patients with psychotic illness (lower dose below 6 mg daily), seizure disorders, hypertension, diabetes.[108] **Dosing:** Assess for potential drug interactions, particularly anticoagulants, anticonvulsants and anticoagulants. Avoid NSAIDs as increases peptic ulceration risk 15-fold together.[109] Reduce dose to the minimum effective dose to avoid side effects.[110]

† Off-label. PO = by mouth IV = Intravenous, SC = Subcutaneous, TID = three times daily,

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MEDICATIONS FOR MANAGEMENT OF COUGH
CONTINUED

QID = four times daily ODT = oral dissolving tablet CSCI = continuous subcutaneous infusion.

Prices for prescription drugs may be obtained from BC PharmaCare. The British Columbia Palliative Care Benefits Plan https://www2.gov.bc.ca/assets/gov/health/health-drug-coverage/pharmacare/palliative-formulary.pdfprovides province wide drug coverage for many of the recommended medications– check website to confirm coverage. **Consider price when choosing similarly beneficial medications, especially when the patient / family is covering the cost.**

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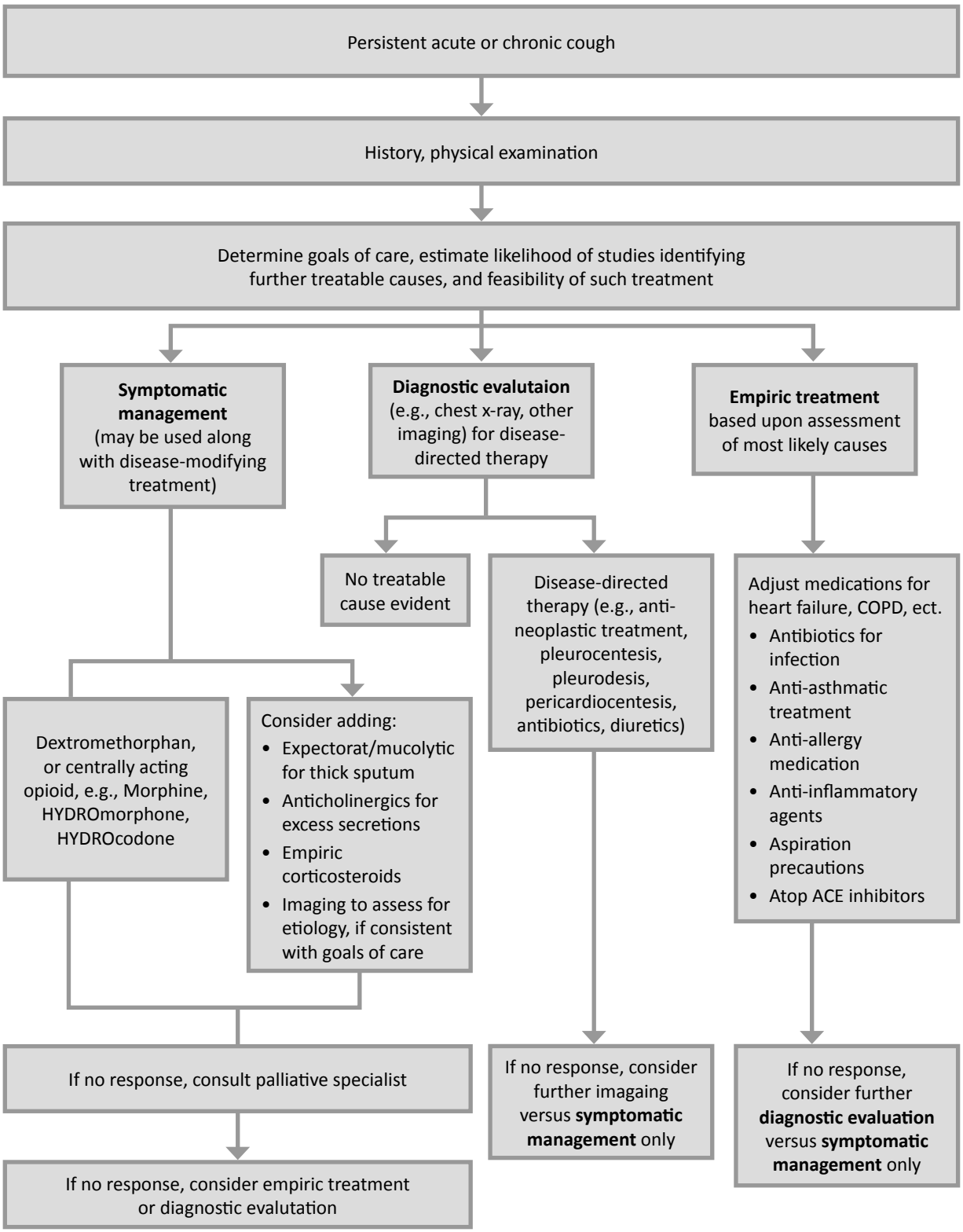
COUGH MANAGEMENT ALGORITHM[6]



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COUGH EXTRA RESOURCES OR ASSESSMENT TOOLS

Treatments for Common Causes of Cough[1-3, 5, 6, 9-11, 14, 21, 29, 30, 45, 47, 48, 54, 55, 61, 71, 86, 93-97,98]

Underlying Cause	Treatment of Choice
ALS	Glycopyrrolate, atropine or scopolamine to dry secretions. (**see** Additional Resources for Management of Cough)
Bronchospasm/Bronchiectasis	Bronchodilators, antibiotics.
Chronic Obstructive Pulmonary Disease (COPD) / **Asthma**	Conventional inhalers/nebulized drugs to dilate airways; cortico-steroids to suppress inflammation. Nebulize saline to reduce viscosity and aid expectoration, if purulent phlegm.
Congestive Heart Failure	Conventional medications to decrease excess fluid, e.g., diuretics.
End stage weakness	Suppress and settle with suppressant, anxiolytic, glycopyrrolate, atropine or scopolamine. (see Respiratory Congestion guideline)
Gastroesophageal reflux	Proton pump inhibitor, H2 inhibitor, motility agent, elevate head of bed, drain contributing ascites.
Infection - Pneumonia	Prevention of aspiration. Oral antibiotics may help decrease productive cough that is disturbing sleep, or causing pain or hemoptysis. Nebulized saline may help patients to expectorate thick, tenacious secretions.
Malignant pleural effusion	Thoracentesis (with PleurX catheter, if repeated drainage required) or pleurodesis; lying on the same side can decrease related cough.
Medications	• Discontinue; replace ACE inhibitors if possible. May sensitize. Antitussives ineffective to treat. ACE-induced cough. • Stop/reduce smoking. Cessation using nicotine patch will minimize airway irritation.
Post radiation lung damage	• Corticosteroids

Superior Vena Cava (SVC) obstruction	• Radiotherapy/corticosteroids
Tumor related airway irritation	• Radiotherapy/brachytherapy, laser treatment, self-expandable stents or corticosteroids.
Upper airway cough syndrome (post-nasal drip) – allergies, infection, sinusitis	• Nasal corticosteroids or ipratropium. Oral antibiotics for sinusitis, expectorants (guaifenesin) or anti-histamine.

Bolded – identifies the causes of cough that are most reversible or treatable.[9, 93]

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