

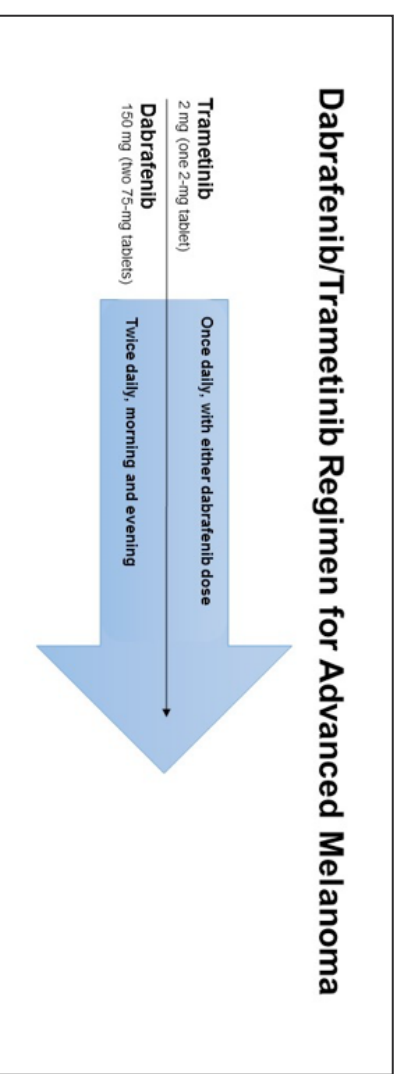
## Dabrafenib/Trametinib Combination Therapy for Melanoma: A Nursing Tool From The Melanoma Nursing Initiative (MNI)

Dabrafenib (Tafinlar<sup>®</sup>)/trametinib (Mekinist<sup>®</sup>) combination therapy is indicated for the treatment of patients with unresectable or metastatic melanoma with BRAF V600E or V600K mutations. Dabrafenib is an inhibitor of some mutated forms of BRAF kinase, and trametinib is a MEK1 and MEK2 inhibitor. About half of patients with melanoma have a mutated form of the BRAF protein in their tumors. Combination MEK/BRAF inhibitor therapy is associated with superior tumor response and patient survival compared with single-agent BRAF inhibitor therapy. Use of the combination also decreases the high rates of secondary cutaneous malignancies associated with single-agent BRAF inhibitory therapy.

This document is part of an overall nursing toolkit intended to assist nurses in optimizing management of melanoma in patients receiving newer anti-melanoma therapies.

# DRUG-DOSING/ADMINISTRATION

- Both dabrafenib and trametinib are orally administered drugs. At the full dose, dabrafenib 150 mg is taken twice daily (once in the morning and once in the evening, 12 hours between doses) for a total daily dosage of 300 mg. Trametinib 2 mg is taken once daily at the same time each day, preferably with either the morning or evening dose of dabrafenib (see diagram below). Dabrafenib/trametinib treatment should continue until disease progression or unacceptable toxicity occurs



- Dabrafenib/trametinib and dabrafenib should be administered on an empty stomach at least 1 hour before or at least 2 hours after eating. Dabrafenib capsules should not be opened, crushed, or broken
- Dabrafenib should be stored at room temperature
- Trametinib must be kept refrigerated
  - » Instruct patients to store trametinib in a refrigerator in the original bottle with the lid closed tightly to protect the medication from heat, light, or moisture
  - » Patients who are traveling should keep trametinib in a refrigerated lunch pack
  - » Temperature excursion data show that trametinib (in an opened bottle) is not damaged by storage outside the refrigerator for as many as 30 days if it is maintained at a temperature below 96°F (30°F). Nurses may advise patients who have inadvertently left trametinib out of the refrigerator to simply keep the medication cool and return it to the refrigerator as soon as possible
- Concurrent administration of strong inhibitors of CYP3A4 or CYP2C8 should be avoided with dabrafenib. Also, dabrafenib is an inducer of CYP3A4, CYP2C8, and several other CYP enzymes; concomitant use of drugs that are sensitive substrates of these CYP enzymes may result in loss of efficacy of these drugs (example, hormonal contraceptives and proton pump inhibitors)

# SIDE EFFECTS AND THEIR MANAGEMENT

- Possible treatment-related adverse events (AEs) should be discussed with patients prior to initiating trametinib/dabrafenib therapy. Patients should be informed of the importance of immediately reporting any health changes that may reflect a treatment-related AE
- AEs associated with trametinib/dabrafenib therapy can be generally divided into those that are most common (but typically mild-to-moderate in severity) and less common but serious AEs. Table 1 shows the common and less common but serious AEs associated with dabrafenib/trametinib as well as other AEs (Appendices 1 and 2)

**Table 1. AEs Associated With Dabrafenib/Trametinib**

irAE category	Examples	Treatment guidance (Appendix number)
Most common	Fever/pyrexia . . . . .	1
	Skin toxicities (rash) . . . . .	1
	Hypertension	
	Chills . . . . .	2
	Cough . . . . .	2
	Headache . . . . .	2
	Peripheral edema . . . . .	2
	Arthralgia/myalgia . . . . .	2
	Anorexia . . . . .	2
	Gastrointestinal . . . . .	2
- Constipation/abdominal pain		
- Nausea/vomiting		
Less common but serious	New primary cancers . . . . .	1
	- Cutaneous (eg, basal cell or squamous cell carcinoma, keratocanthoma, new melanoma)	
	- Non-cutaneous	
	Ocular toxicity . . . . .	1
	Cardiovascular	
	- Cardiomyopathy (↓LVEF) . . . . .	1
	- Hemorrhage . . . . .	2
	- Venous thromboembolism (pulmonary embolism, deep vein thrombosis)	2
	- Hemolytic anemia . . . . .	2
	Colitis and gastrointestinal perforation . . . . .	2
Interstitial lung disease/pneumonitis . . . . .	2	
Renal toxicity . . . . .	2	

# SIDE EFFECTS AND THEIR MANAGEMENT

(CONTINUED)

- Severe and sometimes moderate AEs are commonly managed by dose interruptions or withdrawal. In certain cases, referral to a cardiology, dermatology, or ophthalmology specialist is warranted

**Table 2: Recommended dose reductions for trametinib and dabrafenib**

<b>Dabrafenib</b>	<b>Dose reduction from 150 mg orally twice daily to</b>
First dose reduction . . . . .	100 mg orally twice daily
Second dose reduction . . . . .	75 mg orally twice daily
Third dose reduction . . . . .	50 mg orally twice daily
Subsequent . . . . .	Permanently discontinue if unable to tolerate 50 mg orally twice daily
<b>Trametinib</b>	<b>Dose reduction from 2 mg once daily to</b>
First dose reduction . . . . .	1.5 mg orally once daily
Second dose reduction . . . . .	1 mg orally once daily
Subsequent modification . . . . .	Permanently discontinue if unable to tolerate 1 mg orally once daily

# CLINICAL PEARLS

- Before beginning targeted therapy, patients who previously received immunotherapy should be monitored carefully for possible overlapping toxicities. Several AEs are observed with both targeted and immunotherapy and may result in cumulative toxicities
- Potential drug-drug interactions are an important component of dabrafenib/trametinib therapy for melanoma
  - » Dabrafenib is metabolized by CYP 3A4 and 2C8 and also induces CYP3A4 2C8 and several other enzyme systems. Therefore, dabrafenib efficacy can be reduced by other concomitantly administered agents sharing metabolic pathways. It can also lower the concentrations and efficacy of concomitant drugs as well
  - » Patients should be encouraged to have all their medications filled by a single pharmacy to ensure familiarity with the full medication list and to avoid polypharmacy issues
- Patients should be seen by a dermatologist before beginning treatment, every 2 months during treatment, and as many as 7 months after treatment discontinuation
- New skin cancers often initially present as a new wart, skin sore or reddish bump that bleeds or dose not heal, and/or as a change in size or color of a mole. Patients should be made aware of this association and advised to immediately report any skin changes to the healthcare team
- Advise patients to take pictures of any skin lesions for documentation

## QUESTIONS & ANSWERS

### **Q.** How long do the fevers last?

**A.** During the clinical trials, fevers with BRAK/MEK inhibitor therapy occurred in about 54% of patients. Fevers usually start after about 30 days of treatment, lasting 2-3 days, and typically improving after 6 months. Your patient must contact the oncology team if they begin to experience fevers. For low-grade fevers of 99-101°F, they can take antipyretics as directed by the provider. Also make sure your patient is drinking plenty of water. For a fever higher than 101°F, the oncology team member most likely will hold the BRAF inhibitor, and if the patient's temperature is higher than 104°F, he/she will hold both medications and see the patient in clinic. The patient might need supportive care such as IV hydration and to begin low dose prednisone as recommended by the prescribing information. Some patients might need a dose holiday and dose reduction until fevers resolve. Keeping well hydrated is very important, especially with higher temperatures, to avoid dehydration.

### **Q.** How long will the patient be on BRAF/MEK inhibitor therapy?

**A.** Most likely patients will continue therapy if their disease is responding to therapy and they are tolerating the side effects. During the clinical trials, the patients who had to stop therapy were those who had disease progression or had moderate-to-severe drug toxicities who affected their quality of life and required persistent drug holidays, dose reduction, or discontinuation.

# PATIENT RESOURCES

## Financial Assistance

Resources from Novartis

Novartis Patient Assistance Program (financial and other support)  
1-800-282-7630

[www.us.tafinlarmekinist.com/advanced-melanoma](http://www.us.tafinlarmekinist.com/advanced-melanoma)

## Additional Information Resources

AIM at Melanoma Foundation (Nurse on Call, patient symposia, drug resources, etc)  
<http://www.AIMatMelanoma.org>

American Cancer Society: Targeted therapy for melanoma skin cancer  
<https://www.cancer.org/cancer/melanoma-skin-cancer/treating/targeted-therapy.html>

## ADDITIONAL RESOURCES

- Czupryn M, & Cisneros, J. BRAF/MEK inhibitor therapy: consensus statements from the faculty of the Melanoma Nursing Initiative on managing adverse events and potential drug interactions. *Clin J Oncol Nurs*. 2017; 21 (suppl): 11-29.
- Davis ME. Ocular toxicity of tyrosine kinase inhibitors. *Oncol Nurs Forum*. 2016;43: 235-243. doi:10.1188/16.ONF.235-243
- de Golian E, Kwong BY, Swetter SM, Pugliese SB. Cutaneous complications of targeted melanoma therapy. *Curr Treat Options Oncol*. 2016;17:57. doi:10.1007/s11864-016-0434-0
- How to Take Tafenlar + Mekinist.  
Available at: <https://www.us.tafinlarmekinist.com/advanced-melanoma/about-treatment/dosing-and-administration/>.
- Mavropoulos JC, Wang TS. Managing the skin toxicities from new melanoma drugs. *Curr Treat Options Oncol*. 2014;15:218-301.
- Mekinist®. [package insert]. East Hanover, NJ: Novartis Pharmaceuticals Corporation.  
Available at: <https://www.pharma.us.novartis.com/sites/www.pharma.us.novartis.com/files/mekinist.pdf>.
- Rubin KM. Care and management of unique toxicities associated with MAPK pathway-targeted therapies in patients with advanced melanoma. *Clin J Oncol Nurs*. In press.
- Tafinlar® [package insert]. East Hanover, NJ: Novartis Pharmaceuticals Corporation; 2017.  
Available at: <https://www.pharma.us.novartis.com/sites/www.pharma.us.novartis.com/files/tafinlar.pdf>.
- Welsh SJ, Corrie PG. Management of BRAF and MEK inhibitor toxicities in patients with metastatic melanoma. *Ther Adv Med Oncol*. 2015;7:122-136.

Click here for downloadable action plans to customize for your patients



# APPENDIX 1

## Care Step Pathway - Pyrexia (elevated body temperature in the absence of clinical or microbiological evidence of infection)

### Nursing Assessment

#### Look:

- Does the patient appear unwell?
  - o Diaphoretic?
  - o Pale?
- Does the patient appear dehydrated?
- Is the patient currently febrile?
- If febrile, are rigors present?

#### Listen:

- Onset and duration of fevers
- Associated symptoms (chills, rigors, decreased urine output, hypotension, malaise, fatigue, GI or respiratory symptoms)
- Method of temperature assessment (oral, axillary, temporal)
- Self-management of fevers (OTC agents, medications, tepid baths)
- Adequacy of fluid intake in the last 24 hours (how much, types, etc)
- How the patient has been taking BRAF/MEK1 medications
  - o Symptoms suggestive of infectious etiology (e.g., upper respiratory, urinary)
  - o Recent sick contacts?
  - o Recent exposure to animals?
  - o Recent international or national travel?

#### Recognize:

- Other treatment-related adverse events
- Grade of fever and chills if present
- Other symptoms, such as dehydration, rigors, hypotension (complex pyrexia syndrome)
- Potential infectious causes (via urinalysis, urine culture, throat cultures, blood cultures, etc)
- Impact of symptoms on QOL/performance status

### Grading Toxicity

#### Grade 1 (Mild)

Asymptomatic; mild, low-grade fevers (99.0°F–101.2°F [37.2°C–38.4°C])

#### Grade 2 (Moderate)

Fevers (101.3°F–104.0°F [38.5°C–40.0°C]); mildly symptomatic (chills, etc) affecting ADLs

#### Grade 3 (Severe)

Any fever >104.0°F (>40.0°C) or fever of 101.3°F–104.0°F (38.5°C–40.0°C) that is moderately symptomatic (rigors, chills, decreased urinary output, hypotension); limiting self-care ADLs

#### Grade 4 (Potentially Life-Threatening)

Any fever >101.3°F (38.5°C) that is highly symptomatic (acute renal insufficiency, hypotension requiring hospitalization, prompt supportive care)

#### Grade 5 (Death)

## Management

### Grade 1 (Mild)

- Acetaminophen or ibuprofen q4-6 hrs until fever resolves (<99°F [37.2°C]) for at least 24 hours
  - o Monitor renal and hepatic function during antipyretic treatment
  - o Do not exceed 4000 mg/d acetaminophen or 3200 mg/d ibuprofen
- Increase oral hydration to minimize insensible losses. Suggested fluids: water, juice, sports drinks (e.g., Gatorade®, Powerade®, Pedialyte®)
- Review medication profile with patient and family, including prescriptions, OTCs, herbals, supplements, or other complementary therapies
  - o Determine if concomitant medications contain antipyretics
  - o Assess for potential drug-drug interactions
- Assess patient & family understanding of recommendations and rationale
- Identify barriers to adherence

### Grade 2 (Moderate)

- For temperatures >101.3°F (38.5°C), dabrafenib to be held/trametinib to be continued
- Acetaminophen or ibuprofen q4-6 hrs until fever resolves (<99°F [37.2°C]) for at least 24 hours
  - o Monitor renal and hepatic function during antipyretic treatment
  - o Do not exceed 4000 mg/d acetaminophen or 3200 mg/d ibuprofen
- Institute re-hydration strategies, particularly if patient is hypotensive or there is other clinical concern. Set hydration goals
  - o Oral, advise fluids: water, rehydration drinks (Pedialyte), juice, sports drinks (Gatorade, Powerade), popsicles
  - o Intravenous, as needed
- For pyrexia refractory to antipyretics, CS with prednisone or equivalent will be used (25 mg/d, with downward titration); consider change in targeted therapy, if clinically appropriate (eg, switch from dabrafenib to vemurafenib if fever persists and refractory to antipyretics or prednisone treatment, causing moderate changes in the patient's ADLs)
- Assess patient & family understanding of recommendations and rationale
- Identify barriers to adherence
- Upon symptom and fever resolution (<99°F [37.2°C]) for 24 hours, possible treatment restart with appropriate dose reduction
- For recurrent pyrexia, CS with prednisone or equivalent will be used (10 mg/day for at least 5 days); consider change in targeted therapy, if clinically appropriate (e.g., switch from dabrafenib to vemurafenib if fever persists)

### Grades 3-4 (Severe or Potentially Life-Threatening)

- For fevers >104°F (>40.0°C), or any fever accompanied by chills, hypotension, dehydration, or renal failure, **both** dabrafenib and trametinib will be held
- For intolerable temperatures 102.3°F–104.0°F (39.1°C–40.0°C) and all temperatures >104°F (40.0°C), both vemurafenib and cobimetinib will be held
- Targeted therapy will be held (Grade 3) or discontinued (Grade 4)
- Prompt medical and supportive care interventions
  - o Hospitalization, if clinically indicated
- Acetaminophen or ibuprofen q4-6 hrs until fever resolves (<99°F; 37.2°C) for at least 24 hours
  - o Monitor renal and hepatic function during antipyretic treatment
  - o Do not exceed 4000 mg/d acetaminophen or 3200 mg/d ibuprofen
- Aggressive hydration management to address hypotension, etc
- For pyrexia refractory to antipyretics, CS with prednisone or equivalent will be used; 25 mg/d, with downward titration; consider change in targeted therapy, if clinically appropriate (e.g., dabrafenib to vemurafenib)
- Grade 3: Upon symptom and fever resolution for (<99°F [37.2°C]) for 24 hours, possible treatment restart
  - o Same agents with appropriate dose reductions
  - o Oral corticosteroid premedication (10 mg/d) to be used for second or subsequent pyrexia with dabrafenib if prolonged (>3 days) or with complications
- Change to different targeted therapy regimen, if clinically appropriate (e.g., switch from dabrafenib to vemurafenib if fever persists)
- Assess patient & family understanding of recommendations and rationale
- Identify barriers to adherence

ADL = activities of daily living; CS = corticosteroid; GI = gastrointestinal; OTC = over the counter; QOL = quality of life

## Care Step Pathway - Skin Toxicities

### Nursing Assessment

#### Look:

- Does the patient appear uncomfortable?
- Does the patient appear unwell?
- Is there obvious rash?
- Suspicious skin lesion(s)?
- Xerosis? Is the patient scratching during the visit?
- Skin changes/new lesion(s): photosensitivity reactions, sunburn, or other cutaneous lesions suspicious for actinic keratoses, keratoacanthomas, cutaneous squamous cell carcinomas, or new melanomas?

#### Listen:

- Rash and/or pruritus?
- Other cutaneous symptoms: (eg, photosensitivity)?
- Are symptoms interfering with ADLs? With sleep?
- Have symptoms worsened?
- What interventions has patient tried (if any): effective and ineffective?
- Question patient and family regarding history of skin problems in the past (i.e., sun damage, dermatitis [with prior immunRx], wounds, underlying skin disorders [e.g., psoriasis, eczema])
- Any exposure to new chemicals, soaps, or allergens (animals, travels)?

#### Recognize:

- Is there a personal or family history of dermatitis, pre-existing skin issues (psoriasis, skin cancer, wounds)?
- Is there evidence of scratching, such as abrasions?
- Is skin intact?
  - o Are there skin changes?
    - o Xerosis
    - o Changes in skin pigment or color
    - o Oral involvement?
- Perform comprehensive skin examination and determine grade of toxicity
- What impact have the symptoms had on QOL?
- Relevant social history (occupational, environmental, leisure-type activities)

### Grading Toxicity

#### RASH (maculopapular rash, acneiform rash, or dermatitis)

Definition: A disorder characterized by the presence of macules (flat) and papules (elevated). Maculopapular rash frequently affects the upper trunk, spreading centripetally and associated with pruritus, whereas acneiform rash typically appears on the face, scalp, upper chest, and back.

#### Grade 1 (Mild)

Macules/papules covering <10% BSA with or without symptoms (e.g., pruritus, burning, tightness)

#### Grade 2 (Moderate)

Macules/papules covering 10-30% BSA with or without symptoms (e.g., pruritus, burning, tightness); limiting instrumental ADLs

#### Grade 3 (Severe)

Macules/papules covering >30% BSA with or without associated symptoms; limiting self-care ADLs; skin sloughing covering <10% BSA

#### Grade 4 (Potentially Life-Threatening)

Papules/pustules covering any % BSA, with or without symptoms and associated with superinfection requiring IV antibiotics; skin sloughing covering 10-30% BSA

#### Grade 5 (Death)

### PRURITUS

Definition: A disorder characterized by an intense itching sensation.

#### Grade 1 (Mild)

Mild or localized; topical intervention indicated

#### Grade 2 (Moderate)

Intense or widespread; intermittent; skin changes from scratching (e.g., edema, papulation, excoriations, lichenification, oozing/crusts); oral intervention indicated; limiting instrumental ADLs

#### Grade 3 (Severe)

Intense or widespread; constant; limiting self-care ADL or sleep; oral corticosteroid or immunosuppressive therapy indicated

#### Grade 4 (Potentially Life-Threatening)

#### Grade 5 (Death)

## Management

### Overall Strategy:

- Introduce concept of treatment interruption and possible dose reduction when educating patients prior to initiation of therapy
- Refer for baseline skin examination before beginning therapy and closely monitor at-risk patients
- Assess for other etiology of rash: ask patient about new medications, herbs, supplements, alternative/complementary therapies
- Encourage patients to report any skin changes promptly

### Intervention (at-risk patients)

#### Gentle skin care:

- Avoid soap. Instead, use non-soap cleansers (mild, fragrance- & dye-free soap on the axillae, genitalia, and feet)
- Avoid hot baths
- Avoid tight clothing/shoes
- Keep fingernails short (to avoid scratching)
- Daily applications of nonsteroidal moisturizers or emollients containing humectants (urea, glycerin)
- Apply moisturizers and emollients in the direction of hair growth to minimize development of folliculitis

### Grade 1 (Mild)

- Observation only
- Emollients
- Sun avoidance/sunscreen
- Possible use of topical antihistamines

#### Patient Counseling:

- Emollients twice daily
- Antihistamines and analgesics, if applicable
- Strict UV protection w/ SPF 30 sunscreen/eye protection
- Gentle exfoliation for follicular rash
- Treatment w/ low-potency topical steroids to be started/ possible treatment interruption for persistent or worsening adverse events

### Grade 2 (Moderate)

- Antihistamines and analgesics as needed
- Topical steroids and/or antipruritics (topical/oral) to be started
- Persistent Grade 2: therapy to be held until Grade 0-1

#### Patient Counseling:

- Start oral steroid, taper no longer than 7 days
- Rash: consider topical antibiotic (clindamycin gel) if indicated
- Consider referral to dermatologist
- Treatment to be held until Grade 0-1
- Rash: consider topical antibiotic
- Refer to dermatologist

### Grade 3 (Severe)

- Treatment to be held until <Grade 1; resume at a lower dose
- Oral steroid to be started, taper no longer than 7 days
- Rash: consider topical antibiotic
- Refer to dermatologist

#### Patient Counseling:

- Anticipatory guidance regarding treatment discontinuation or possible hospitalization for steroids and/or hydration
- Anticipatory guidance regarding treatment discontinuation or possible hospitalization for steroids and/or hydration
- Referral to dermatologist

### Grade 4 (Potentially Life-Threatening)

- Targeted therapy to be permanently discontinued
- Consider hospitalization for IV hydration, steroids, IV antibiotics, electrolyte replacement

#### Patient Counseling:

- Anticipatory guidance regarding treatment discontinuation or possible hospitalization for steroids and/or hydration
- Referral to dermatologist

### Advise sun protective measures:

- Use of UV-protective clothing, sunglasses, sunscreen against UVA rays or broad spectrum (UVA/UVB), avoidance of direct and indirect sunlight
- Assess patient and family understanding of prevention strategies and rationale
- Identify barriers to adherence

### RED FLAGS:

- Extensive rash (>50% BSA), or rapidly progressive
- Skin sloughing
- Oral involvement
- Concern for superinfection



ADL = activities of daily living; BSA = body surface area; QOL = quality of life

## Care Step Pathway - Ocular Toxicity

### Nursing Assessment

#### Look:

- Does the patient look unwell (or ill)?
- Does the patient look uncomfortable?
- Does the patient look jaundiced?
- Is there any eye redness? Drainage? Tearing?
- Are pupils reactive?
- Is the patient sensitive to light?
- Is there lid or periorcular edema?
- Are there skin lesions surrounding the eye(s)?

#### Listen:

- Patient and family descriptions of current ocular health and any eye problems, both current and in the past (e.g., glaucoma, retinal issues, eye inflammation)
- Reports of specific eye complaints: redness, watering, drainage, change in acuity, diplopia, floaters, photophobia?
- When did symptoms start?
- Any recent eye injury, new medications, or exposure to toxic chemicals?
- Does the patient wear contact lenses?
- Is the patient diabetic?
- Associated symptoms: headache, vomiting, nausea?

#### Recognize:

- Patients at risk
- The specific ocular complaint (if possible) and determine grade
- Other treatment-related symptoms
- How vision limitations affect OOL
- Need for urgent evaluation (if indicated)

### Grading Toxicity (Overall, Ocular Toxicity)

#### Grade 1 (Mild)

Asymptomatic; clinical or diagnostic observations only

#### Grade 2 (Moderate)

Symptomatic (pain, irritation, photosensitivity, etc.); visual acuity falls to 20/40 or better in affected eye(s); limiting instrumental ADLs

#### Grade 3 (Severe)

Highly symptomatic (pain, irritation, photosensitivity, etc), marked decrease in visual acuity (worse than 20/40) in affected eye(s); limiting self-care ADLs

#### Grade 4 (potentially life-threatening)

Blindness (20/200 or worse) in affected eye(s)



## Management

### Overall Strategy:

- Refer for baseline ophthalmic examination before beginning therapy (ophthalmologist should be made aware that patient is to start combination therapy)
- Follow-up exam if patients develop symptoms
- Advise patients to promptly report any changes in vision or any eye symptoms (and anticipate treatment hold pending further evaluation)
- Identify and closely monitor at-risk patients (including those with a history of glaucoma, dry eyes, uveitis, retinal disease, macular degeneration)
- Promote healthy lifestyle:
  - o Diet (potentially including dietary supplements containing omega-3 and omega-6 fatty acids for dry eye syndrome)
  - o Smoking cessation, control of comorbidities
  - o Encourage use of sunglasses and reduction in sun exposure
  - o Promote good hand hygiene
  - o In patients with diabetes, promote good control of blood glucose since it reduces risk of retinal disease
- If contact lenses are worn, advise patients to be meticulous about eye hydration, lens hygiene, and not using lenses beyond their disposal time

### Specific Ocular Issues:

- When ocular issues are identified, anticipate management by the treating ophthalmologist (and provide anticipatory guidance/assistance, as appropriate):
  - o Keratitis (inflammation of cornea); artificial tears, lubricants, or CS drops, antibiotics
  - o Uveitis (inflammation of various portions of the eye): CS drops, beta blockers, alpha antagonists, mydriatic ophthalmic drops
  - o Conjunctivitis (inflammation of the interior eyelids): antihistamines, CS, cool compresses, artificial tears, antibiotics if needed
  - o Photophobia (oversensitivity to light): sunglasses, dim lights
  - o Serous retinal detachment (fluid accumulation under layers of retina): drug hold/dose reduction/discontinuation
  - o Retinal vein occlusion (vascular event leading to vision changes, macular edema, glaucoma): anti-VEGF and steroid injection in addition to drug discontinuation
  - o Retinal pigment epithelial detachment (bilateral or multifocal separation of the retina from back of eye, leading to sudden vision changes): drug hold/dose reduction/discontinuation

### Grade 1 (Mild)

- In general, anticipate referral to ophthalmology
- Specific targeted therapy dose modifications:
  - o Uveitis: BRAFi may be continued with caution; MEKi can be continued; obtain prompt visit with ophthalmologist
  - o Other ocular adverse events: follow standard dose modification/holds based on grade
- Support adherence to eye drops/topical therapy

### Grade 2 (Moderate)

- Urgent referral to ophthalmology (within 24 hours)
- Specific targeted therapy dose modifications:
  - o Uveitis (persistent Grade 2 or >6 weeks duration): hold BRAFi therapy
  - o Serous retinopathy: withhold MEKi until visual symptoms improve. Use dose reduction scheme based on severity
  - o Retinal vein occlusion: permanently discontinue trametinib and cobimetinib
- Retinal pigment epithelial detachment: hold trametinib; reduce dose or discontinue if no improvement after 3 weeks. Assess adherence to eye drops/topical therapy
- Anticipate drug holds/dose modifications of targeted therapy for other moderate ocular toxicities, per prescribing information
- Obtain ophthalmology clearance prior to restarting therapy

### Grades 3 or 4 (Severe)

- Urgent referral to ophthalmology (within 24 hours)
- Specific targeted therapy drug modifications/holds/discontinuations:
  - o Uveitis (severe): hold dabrafenib, permanently discontinue if no improvement within 6 weeks
  - o Serous retinopathy: withhold MEKi until visual symptoms improve. Use dose reduction scheme based on severity
  - o Retinal vein occlusion: permanently discontinue trametinib and cobimetinib
  - o Retinal pigment epithelial detachment: hold trametinib; reduce dose or discontinue if no improvement after 3 weeks
- Anticipate permanent discontinuation of targeted therapy for other severe ocular toxicities, per prescribing information
- Assess adherence to eye drops/topical therapy
- Obtain ophthalmology clearance prior to restarting therapy

### RED FLAGS:

- Sudden vision disturbances such as photosensitivity, eye pain, and redness
- Patient is unable to perform regular ADLs because of ocular issues
- Gradual or sudden visual loss
- Concern for permanent loss of vision



ADLs = activities of daily living; CS = corticosteroids; QOL = quality of life

## Care Step Pathway - Cardiotoxicity

### Nursing Assessment

#### Look:

- Does the patient look unwell?
- Fatigued?
- Diaphoretic?
- SOB or in respiratory distress?
- Is there leg edema?

#### Listen for new and worsening symptoms:

- Change in energy level?
- SOB or DOE?
- Leg edema?
- Palpitations?
- Changes in BP?
- Dizziness or syncope?
- What exacerbates or improves symptoms?
- Any new prescribed or OTC meds? Illicit substances?
- Any underlying cardiac disease (CAD, MI, or other)?
- What exacerbates or improves symptoms?
- Prior radiation therapy?

#### Recognize:

- Determine specific toxicity and related grade (if applicable)
- Other related symptoms: hypotension, syncope, chest pain, DOE, SOB, palpitations, edema, etc.
- Impact of symptoms on QOL performance status
- Changes in cardiac function: ECG changes, decreased EF, elevated cardiac enzymes (troponin, CK)
- Assess other changes in oxygen saturation, BP, lung function

### Grading Toxicity

**Heart failure (left ventricular):** A disorder characterized by the inability of the heart to pump blood at an adequate volume to meet tissue metabolic requirements.

#### Grade 1 (Mild)

Asymptomatic with laboratory or cardiac imaging abnormalities

#### Grade 2 (Moderate)

Symptoms with mild to moderate activity or exertion

#### Grade 3 (Severe)

Severe with symptoms at rest or with minimal exertion (intervention needed)

#### Grade 4 (Potentially Life-Threatening)

Life threatening consequences (urgent intervention required)

#### Grade 5 (Death)

**QTc interval prolongation:** A finding of a cardiac dysrhythmia characterized by an abnormally long corrected QT interval.

#### Grade 1 (Mild)

QTc 450–480 ms

#### Grade 2 (Moderate)

QTc 481–500 ms

#### Grade 3 (Severe)

QTc  $\geq$ 501 ms on at least 2 separate ECGs

#### Grade 4 (Potentially Life-Threatening)

QTc  $\geq$ 501 or  $>$ 60 ms change from baseline and torsade de pointes, polymorphic ventricular tachycardia, or signs or symptoms of serious arrhythmia

#### Grade 5 (Death)



## Management

### Overall Strategy:

- Review concomitant treatments that may affect heart function, particularly the QTc interval (e.g., fluoroquinolones, ondansetron, HIV antivirals)
- Full cardiac workup at baseline: ECG (for vemurafenib), ECHO/MUGA (for any MEK-containing regimen), cardiac enzymes, CBC, CMP, BNP, C-reactive protein, CXR. Do not start MEKI therapy if QTc >500 ms
- Repeat ECHO for MEK-containing regimen at 1 month and every 2–3 months while on treatment. If ECG performed (on vemurafenib), repeat ECG at 14 days, monthly x3, and then every 2–3 months while on treatment, more frequently if on medications affecting QTc, or as needed if patient starts new agents that may prolong QT interval
- Prevention (no known strategies), but encourage healthy lifestyle
- Introduce concept of dose reduction or dose holding when educating patients prior to initiation of therapy
- Assess adherence with BP medications if patients are hypertensive

### Grade 1 (Mild)

- Anticipate cardiology referral if condition worsens
- MEK inhibitors (cobimetinib and trametinib) to be held for a LVEF value decreased >10% from baseline and below the institution's LLN
- Promote adequate hydration and medication adherence
  - Advise patients to avoid alcohol intake or other psychoactive substances
  - Encourage evaluation of lipid panel to assess cardiovascular risk
  - Promote healthy lifestyle
    - o Smoking cessation, control of comorbidities, stress reduction, weight control, exercise

### Grade 2 (Moderate)

- Anticipate cardiology referral
- Trametinib to be discontinued for symptomatic congestive heart failure or a LVEF value decreased  $\geq 20\%$  from baseline and below the institution's LLN
- Cobimetinib to be discontinued for a persistent LVEF value decrease >10% from baseline and below the institution's LLN or for persistent symptoms
- Dabrafenib to be held for a LVEF value decreased 20% from baseline and below the institution's LLN
- Anticipate prompt evaluation of current cardiac symptoms by oncologist or cardiologist if there are nonurgent cardiac symptoms
- Seek immediate care in emergency department for chest pain/pressure to evaluate for MI

### Grades 3-4 (Severe or Life-threatening)

- Anticipate urgent cardiology referral
- For QTc >500 ms, vemurafenib to be held and permanently discontinued if QTc remains >500 ms and increased 60 ms from pretreatment (after controlling cardiac risk factors for QTc interval prolongation)
- For persistent LVEF decrease, targeted therapies to be permanently discontinued
- Assess cardiac function: lipid profile, ECG, ECHO/MUGA, stress test, BNP, cardiac enzymes
- Seek immediate care in emergency department for chest pain/pressure to evaluate for MI

BNP = brain natriuretic peptide; BP = blood pressure; CAD = coronary artery disease; CBC = complete blood count; CK = creatine kinase; CMP = complete metabolic panel; CXR = chest radiograph; DOE = dyspnea on exertion; ECG = electrocardiography; ECHO = echocardiography; EF = ejection fraction; GI = gastrointestinal; HIV = human immunodeficiency virus; LLN = lower limit of normal; LVEF = left ventricular ejection fraction; MI = myocardial infarction; MUGA = multigated acquisition scan; OTC = over the counter; QOL = quality of life; SOB = short of breath.

# APPENDIX 2

## Detection and management of AEs and laboratory abnormalities not included in Care Step Pathways for trametinib/dabrafenib

Adverse event	Common symptoms	Common management/anticipatory guidance*
Anorexia	Decreased appetite (occurs at higher rates in elderly patients)	<ul style="list-style-type: none"> <li>• Monitor weight; query patient about appetite/eating habits; advise dietary modification if necessary</li> <li>• Anticipate treatment hold for intolerable Grade 2 (oral intake altered) or Grade 3/4 (significant weight loss or malnutrition or life-threatening consequences)</li> </ul>
Arthralgias/myalgias	Joint pain swelling, or stiffness, feeling tired	<ul style="list-style-type: none"> <li>• Query patients regarding joint symptoms; standard supportive care (analgesia and anti-inflammatory drugs)</li> <li>• Anticipate treatment hold for intolerable Grade 2 (moderate pain, limiting instrumental ADLs) or Grade 3 (severe pain and self-care ADL limitations)</li> </ul>
Chills	Shaking feeling/cold in absence of fever	<ul style="list-style-type: none"> <li>• Query about symptoms, including symptoms related to serious febrile reactions</li> <li>• Anticipate treatment hold for intolerable Grade 2 (moderate tremors) or Grade 3 (severe or prolonged chills that are not responsive to narcotics)</li> </ul>
Constipation/ Abdominal pain	Infrequent stools/ difficulty stooling, abdominal pain	<ul style="list-style-type: none"> <li>• Increase fluid; fiber; laxatives. Consider appropriate testing to evaluate bowel obstruction</li> <li>• Anticipate treatment hold for intolerable Grade 2 (persistent symptoms of constipation or moderate pain limiting instrumental ADLs) or Grade 3/4 (constipation with manual evacuation indicated, severe abdominal pain, or life-threatening consequences)</li> </ul>
Cough	Dry cough, shortness of breath, DOE	<ul style="list-style-type: none"> <li>• Advise patients to report any symptoms; rule out infectious causes and pneumonitis (interstitial lung disease); monitor oxygen saturation (pulse oximetry) and consider chest x-ray; standard supportive care</li> <li>• Anticipate treatment hold for intolerable Grade 2 (moderate symptoms, limiting instrumental ADLs) or Grade 3 (severe symptoms)</li> </ul>
Deep vein thrombosis	Swelling, leg pain, shortness of breath	<ul style="list-style-type: none"> <li>• Advise patients to seek medical care if they have acute onset arm/leg swelling</li> <li>• Anticipate treatment hold of trametinib for Grade 2 (uncomplicated DVT) and permanent discontinuation if not improved after 3 weeks; no dose modification for dabrafenib for uncomplicated venous thromboembolism</li> </ul>

## Detection and management of AEs and laboratory abnormalities not included in Care Step Pathways for trametinib/dabrafenib

(Continued)

Adverse event	Common symptoms	Common management/anticipatory guidance*
Edema	Swelling of limbs, etc	<ul style="list-style-type: none"> <li>Occurs at higher rates in elderly patients. Advise patients to report swelling; standard supportive care; cardiac workup may be indicated</li> <li>Anticipate treatment hold for intolerable Grade 2 (moderate swelling, limiting instrumental ADLs) or Grade 3 (severe swelling, gross deviation from anatomic contour)</li> </ul>
Embryo-fetal toxicity	—	<ul style="list-style-type: none"> <li>Trametinib/dabrafenib can cause fetal harm. Females and males of child-bearing potential should use effective nonhormonal birth control during trametinib/dabrafenib treatment and for 4 months after stopping trametinib/dabrafenib treatment</li> </ul>
Fatigue	Unrelenting exhaustion not relieved by rest	<ul style="list-style-type: none"> <li>Query patients regarding energy level; evaluate possible contributory factors, including infection, disease progression, and hematological and biochemical abnormalities; standard supportive care</li> <li>Anticipate treatment hold for fatigue not relieved by rest and limiting ADLs (Grade 2/3)</li> </ul>
Headache	Pain and/or change in vision	<ul style="list-style-type: none"> <li>May be multifactorial. For severe or persistent symptoms, consider other causes such as bleeding in the brain, uncontrolled hypertension, dehydration, new CNS disease, or other causes; consider brain MRI and evaluations for hypertension</li> <li>Anticipate treatment hold for intolerable Grade 2 (moderate pain) or Grade 3 (severe pain, limiting self-care ADLs)</li> </ul>
Hemolytic anemia (in patients with G6PD deficiency)	Yellow skin, weakness or dizziness, shortness of breath	<ul style="list-style-type: none"> <li>Monitor patients with G6PD deficiency for signs of hemolytic anemia. Advise patients to report any symptoms</li> </ul>
Hemorrhage	Red or black/tarry stools; blood in urine; headaches; coughing or vomiting blood; abdominal pain; unusual vaginal bleeding; fatigue; dizziness or weakness	<ul style="list-style-type: none"> <li>Standard supportive care; medical intervention as indicated</li> <li>Anticipate treatment hold for intolerable Grade 2 (moderate bleeding) or Grade 3/4 (severe bleeding requiring transfusion or radiologic, endoscopic, or operative intervention or life-threatening consequences)</li> </ul>

## Detection and management of AEs and laboratory abnormalities not included in Care Step Pathways for trametinib/dabrafenib

(Continued)

Adverse event	Common symptoms	Common management/anticipatory guidance*
Hyperglycemia	Fatigue, polyuria, polydipsia, headaches	<ul style="list-style-type: none"> <li>• Monitor fasting glucose/Hemoglobin A1C (particularly in patients with pre-existing diabetes/hyperglycemia); advise patients to report increased thirst/increased urination; provide anti-diabetic medication</li> <li>• Anticipate treatment hold for intolerable Grade 2 (fasting glucose &gt;160 to 250 mg/dL) or Grade 3/4 (fasting glucose &gt;250 mg/dL)</li> </ul>
Nausea/Vomiting	Vomiting, queasiness, RUQ or LUQ pain	<ul style="list-style-type: none"> <li>• For most cases, standard supportive care will be adequate</li> <li>• May indicate hepatotoxicity; check LFTs/lipase/amylase</li> <li>• Anticipate treatment hold for intolerable Grade 2 (oral intake decreased or 3 -5 episodes vomiting in 24 hours) or Grade 3/4 (inadequate oral intake or ≥6 episodes vomiting in 24 hours or life-threatening consequences)</li> </ul>
Pulmonary embolism	Shortness of breath/ chest pain	<ul style="list-style-type: none"> <li>• Advise patients to seek medical care if they have shortness of breath, chest pain; appropriate workup, including imaging and CT angiogram</li> <li>• Anticipate treatment hold of trametinib and permanent discontinuation if not improved after 3 weeks or for life-threatening PE</li> <li>• Anticipate treatment hold of dabrafenib and permanent discontinuation if no recovery to Grade 0–1</li> <li>• Anticipate anticoagulant therapy for at least 6 months</li> </ul>
Pneumonitis (interstitial lung disease)	New cough, dyspnea, hypoxia, pleural effusion or infiltrates	<ul style="list-style-type: none"> <li>• Advise patients to report any new or worsening symptoms of lung or breathing problems (shortness of breath/cough)</li> <li>• Anticipate permanent discontinuation of trametinib; do not modify the dose of dabrafenib</li> </ul>
Renal toxicity	Decreased urine, blood in urine, swelling of ankles, decrease in appetite	<ul style="list-style-type: none"> <li>• Measure serum creatinine before treatment initiation and periodically during treatment; monitor kidney function</li> <li>• Anticipate treatment hold with intolerable Grade 2 (eGFR or CrCl 59 to 30 mL/min/1.73 m<sup>2</sup>) or Grade 3/4 (eGFR or CrCl ≤29 mL/min/1.73 m<sup>2</sup>)</li> </ul>
<p>*When treatment holds are required, resume therapy at a lower dose level following improvement to Grade 0 to 1. Permanently discontinue targeted therapies in case of persistent intolerable Grade 2 events, persistent Grade 3 events, and persistent or recurrent Grade 4 events unless otherwise specified</p>		