Regimen Monograph

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A - Regimen Name

MFOLFOX6+BEVA Regimen

Folinic Acid (Leucovorin)-Fluorouracil-Oxaliplatin-Bevacizumab

Disease Site Gastrointestinal

Colorectal

Small bowel and appendix

Intent Palliative

Regimen Category

Evidence-Informed:

Regimen is considered appropriate as part of the standard care of patients; meaningfully improves outcomes (survival, quality of life), tolerability or costs compared to alternatives (recommended by the Disease Site Team and national consensus body e.g. pan-Canadian Oncology Drug Review, pCODR). Recommendation is based on an appropriately conducted phase III clinical trial relevant to the Canadian context OR (where phase III trials are not feasible) an appropriately sized phase II trial. Regimens where one or more drugs are not approved by Health Canada for any indication will be identified under

Rationale and Use.

Rationale and Uses

Treatment of metastatic colorectal, small bowel and appendiceal cancer

Supplementary Public Funding **bevacizumab**

New Drug Funding Program (Bevacizumab (Biosimilar) - Metastatic

Colorectal, Small Bowel, or Appendiceal Cancer) (NDFP Website)

B - Drug Regimen			
<u>bevacizumab</u>	5 mg /kg	IV	Day 1
<u>oxaliplatin</u>	85 mg /m²	IV over 2 hours	Day 1
<u>leucovorin</u>	400 mg /m²	IV over 2 hours (concurrently with oxaliplatin)	Day 1
fluorouracil THEN	400 mg /m²	IV bolus, after leucovorin	Day 1
<u>fluorouracil</u>	2400 mg /m²	IV continuous infusion over 46 hours (single dose)	•
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C - Cycle Frequency

REPEAT EVERY 14 DAYS

Until disease progression or unacceptable toxicity

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D - Premedication and Supportive Measures

Antiemetic Regimen: Moderate

Also refer to CCO Antiemetic Recommendations.

Screen for hepatitis B virus in all cancer patients starting systemic treatment. Refer to the hepatitis B virus screening and management guideline.

Avoid mucositis prophylaxis with ice chip as cold temperatures can precipitate or exacerbate acute neurological symptoms of oxaliplatin.

Oxaliplatin premedication (prophylaxis for infusion reactions):

- There is insufficient evidence that routine prophylaxis with pre-medications reduces IR rates.
- Consider corticosteroids and H1-receptor antagonists ± H2-receptor antagonists in high-risk patients (i.e. ≥ cycle 6, younger age, female gender, prior platinum exposure, platinum-free interval ≥ 3 years).

Bevacizumab premedication (prophylaxis for infusion reactions):

• Routine primary prophylaxis is not recommended; the use of secondary prophylaxis premedications should be based on clinical judgement.

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E - Dose Modifications

Doses should be modified according to the protocol by which the patient is being treated.

Bevacizumab should not be initiated in patients with recurrent hemoptysis, uncontrolled hypertension or wounds that require healing.

Prior to treatment, a dental evaluation should be performed and major dental procedures completed.

Patients should be tested for DPD deficiency before starting treatment with fluorouracil. Refer to the <u>DPD Deficiency Guidance for Clinicians</u> for more information.

In patients with unrecognized DPD deficiency, acute, life-threatening toxicity may occur; if acute grade 2-4 toxicity develops, treatment should be stopped immediately and permanent discontinuation considered based on clinical assessment of the toxicities.

Dosage with toxicity

mFOLFOX:

No dose adjustments required for leucovorin. Leucovorin should be omitted if fluorouracil is omitted.

Neurotoxicity was graded based on the following scales in some metastatic colorectal cancer trials.

Neurotoxicity Grade	Metastatic	
1	Resolved and did not interfere with functioning	
2	Interfered with function but not daily activities	
3	Pain or functional impairment that interfered with daily activities	
4	Persistent impairment that is disabling or life-threatening	

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Toxicity Grade	Oxaliplatin [^]	Fluorouracil^
Persistent ⁽¹⁾ Grade 2 neurotoxicity	↓ to 65 mg/m ²	No change
Transient ⁽¹⁾ Grade 3 neurotoxicity	↓ to 65 mg/m ²	No change
Persistent ⁽¹⁾ ≥ Grade 3 neurotoxicity or any Grade 4 neurotoxicity	Discontinue	No change
 ≥ Grade 3 GI toxicity (after prophylaxis) OR ≥ Grade 3 Platelets OR ≥ Grade 3 Neutropenia (including febrile neutropenia) 	↓ to 65 mg/m ²	Reduce by 20%
Sepsis / septic shock	Discontinue	Discontinue
Other ≥ grade 3 related organ toxicity ⁽²⁾	↓ to 65 mg/m ²	Reduce by 20%
Pharyngolaryngeal dysesthesia	Hold; then increase duration of infusion to 6 hours ⁽³⁾	No change
Pneumonitis	Hold, investigate; discontinue confirmed.	e permanently if
Anaphylactic-like reaction	Discontinue	
RPLS		
Hemolytic uremic syndrome or any signs of microangiopathic hemolytic anemia		
Disseminated intravascular coagulation		
QT prolongation		
Intestinal ischemia or duodenal ulcer		
Symptoms of rhabdomyolysis		

[^]Do not re-treat until the ANC \geq 1.5 x 10⁹/L and the platelets \geq 75-100 x 10⁹/L, GI and neurotoxicities have resolved and other non-hematologic toxicities \leq grade 1.

Bevacizumab:

Dose reductions are not recommended. Bevacizumab should be held or discontinued based on toxicity.

¹ Transient = >7 days - <1 cycle; persistent = ≥ 1 cycle

 $^{^{\}rm 2}$ For skin toxicity, reduce 5FU dose only

 $[\]overset{\text{.}}{\text{\ }}$ If oxygen saturation is normal, an anxiolytic agent may be given.

Bevacizumab	Toxicity				
action	Any grade	Grade 3	Grade 4		
Hold:	Uncontrolled hypertension				
	Delayed wound healing				
	Proteinuria ≥ 2g/ 24 hours*				
	Surgery**				
Discontinue:		Hypertension not controlled with medical management	Hypertension		
	Wound dehiscence, poor healing requiring medical intervention; necrotizing fasciitis				
	Nephrotic syndrome; non-recovery of proteinuria ≥ 2g/24 hours				
	Tracheo-esophageal fistula, other non-GI fistulae		Any internal fistula		
	GI Perforation or fistula				
	PRES, hypertensive encephalopathy				
	Arterial thromboembolism	Pulmonary embolism	Venous thromboembolism (including pulmonary embolism)		
	Symptomatic cardiac failure				
	Recurrent hemoptysis > 2.5 mL	Bleeding (any)	Bleeding (any)		
	Intracranial bleeding				

^{*} may restart when < 2g/24hrs

^{**} for 28 days PRIOR (if surgery elective) and AFTER major surgery, or until wound healed

Management of Infusion-related reactions:

Also refer to the CCO guideline for detailed description of <u>Management of Cancer Medication-Related Infusion Reactions</u>.

Oxaliplatin:

Grade	Management	Oxaliplatin Re-challenge	
1 or 2	 Stop or slow the infusion rate. Manage the symptoms. Restart: After symptom resolution, restart with pre-medications ± reduced infusion rate. 	 Consider pre-medications* and infusing at a reduced infusion rate prior to re-challenge. May consider adding oral montelukast ± oral acetylsalicylic acid. 	
3 or 4	 Stop treatment. Aggressively manage symptoms. 	 Re-challenge is discouraged, especially if vital signs have been affected. Consider desensitization if therapy is necessary. 	

^{*} Up to 50% of patients can experience recurrent reactions during re-challenge despite using pre-medications (e.g. corticosteroid and H1/H2-receptor antagonist).

Bevacizumab:

Grade	Management	Bevacizumab Re-challenge
1 or 2	Stop or slow the infusion rate.Manage the symptoms. Restart:	No specific recommendations can be made at this time
	 Once symptoms resolve, the infusion can be restarted at a slower rate, unless a serious reaction occurred. 	
3 or 4	Stop treatment.Aggressively manage symptoms.	

Hepatic Impairment

Bilirubin		AST/ALT	oxaliplatin (% previous dose)	fluorouracil (% previous dose)	leucovorin (% previous dose)	bevacizumab (% previous dose)
1-2 x ULN			No change	Caution	No change	No data. Not a major route of
>2-4 x ULN	And/or	2-4 x ULN			metabolism or excretion.	
>4 x ULN	And/or	4 x ULN	No data	OMIT if Bilirubin	OMIT if 5FU	
ANY	Or	> 4 X ULN	available	> 4 x ULN	omitted	

Renal Impairment

Creatinine Clearance (mL/min)	oxaliplatin (% previous dose)	fluorouracil (% previous dose)	leucovorin (% previous dose)	bevacizumab
≥50	No change	No change	No change	No data. Not a
30 to <50	Caution	No change; monitor	major route metabolism	
<30	Discontinue	Caution, consider dose ↓		excretion.

Dosage in the Elderly

For oxaliplatin, patients ≥ 65 years had a higher incidence of GI toxicity, myelosuppression, syncope and fatigue. No dose adjustments were needed but caution should be exercised.

Use bevacizumab with caution; patients > 65 years old have an increased risk of arterial thrombotic events as well as myelosuppression, fatigue, proteinuria, hypertension, dizziness, dysphonia, anorexia and GI effects (except gastrointestinal perforation).

F - Adverse Effects

Refer to <u>oxaliplatin</u>, <u>leucovorin</u>, <u>fluorouracil</u>, <u>bevacizumab</u> drug monograph(s) for additional details of adverse effects

Very Common (≥50%)	Common (25-49%)	Less common (10- 24%)	Uncommon (< 10%), but may be severe or life- threatening
 Sensory neuropathy (may be severe, including cranial) Myelosuppression ± infection, bleeding (may be severe) Nausea, vomiting ECG changes (mostly asymptomatic) ↑ LFTs (may be severe) Diarrhea (may be severe) 	 Fatigue Hypertension (may be severe) Mucositis (may be severe) Pharyngolaryngeal dysesthesia Proteinuria (may be severe) Headache Alopecia (mostly mild) 	 Anorexia. weight changes Abdominal pain Constipation Edema Hyperglycemia Musculoskeletal pain Rash, hand-foot syndrome (may be severe) Venous thromboembolism (may be severe) Insomnia Cough, dyspnea (may be severe) Cardiotoxicity (may be severe) Dysgeusia Injection site reaction Abnormal electrolytes Hypersensitivity Dysphonia 	 Venous / Arterial thromboembolism QT prolongation/ arrhythmia Pulmonary hypertension Guillain-Barre syndrome Optic neuritis Extrapyramidal or cortical dysfunction, acute cerebellar syndrome PRES Leukoencephalopathy Nephrotoxicity Pneumonitis INR / prothrombin time increased Disseminated intravascular coagulation Hemolysis Hemolytic uremic syndrome Idiopathic thrombocytopenic purpura Thrombotic microangiopathy Photosensitivity Radiation recall reaction Necrotizing fasciitis Delayed wound healing Osteonecrosis (jaw, other) GI obstruction/ perforation/ ulcer/ ischemia Pancreatitis Veno-occlusive disease Rhabdomyolysis Hearing impaired Eye disorders

G - Interactions

Refer to oxaliplatin, leucovorin, fluorouracil, bevacizumab drug monograph(s) for additional details

- Use of fluorouracil within 4 weeks of treatment with brivudine, sorivudine (and chemically related analogues) is **contraindicated.**
- Thiazide diuretics may decrease renal excretion of fluorouracil; consider an alternative antihypertensive.
- Do not use with diuretics in patients who are receiving bevacizumab and platinum-based chemotherapy (oxaliplatin).
- Avoid concomitant use of metronidazole and fluorouracil if possible.
- Monitor INR closely while on concomitant warfarin and fluorouracil or oxaliplatin; adjust warfarin dose accordingly.
- Monitor phenytoin levels if used concurrently with fluorouracil.
- Monitor for toxicity when using oxaliplatin with other nephrotoxic drugs, QT-prolonging drugs or drugs associated with rhabdomyolysis.
- Caution with the concurrent use of cimetidine due to interference with fluorouracil metabolism; fatal cases have been reported.

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H - Drug Administration and Special Precautions

Refer to oxaliplatin, leucovorin, fluorouracil, bevacizumab drug monograph(s) for additional details

Administration

Bevacizumab:

Different bevacizumab products are not interchangeable.

- **Do not** administer as an IV push or bolus.
- Bevacizumab infusions should **not** be administered or mixed with dextrose or glucose solutions due to potential for drug degradation.

- Mix in 100 mL bag NS. (Dilution should be 1.4 -16.5 mg/mL).
- Compatible with PVC or polyolefin bags.
- Do not shake. Should not be mixed or diluted with other drugs.
- Infused over 90 minutes as loading dose, if well tolerated next infusion can be given over 60 minutes; if well tolerated, can thereafter be given over 30 minutes as maintenance dose
- Bevacizumab rapid infusion (over 10 minutes) has safely been administered with no significant increase in infusion reactions (for 5mg/kg and 7.5mg/kg doses).
- Refrigerate unopened vials and protect from light; do not freeze.

Oxaliplatin:

- Oxaliplatin is administered by intravenous infusion.
- Oxaliplatin should always be administered before fluorouracil.
- May be mixed in 250-500 mL bag of D5W only. Do not mix with NS, chloride containing or alkaline solutions, or with fluorouracil.
- Administer by slow infusion. Concentration must be between 0.2 to 0.7 mg/mL
- Infuse IV over 2 hours. Increasing infusion time to 6 hours may decrease acute toxicity such as pharyngolaryngeal dysesthesia.
- Do not mix oxaliplatin with other drugs in the same infusion bag or infusion line.
- Infusion may be given at the same time as leucovorin in separate D5W bags using a Y-site, providing trometamol is not used as an excipient. Do not administer concurrently with fluorouracil.
- If another drug is given before oxaliplatin, flush infusion line with D5W before giving oxaliplatin. Flush the line with D5W after oxaliplatin before giving a subsequent drug (e.g. fluorouracil).
- The compatibility of oxaliplatin solution for infusion has been tested with representative, PVCbased, administration sets.
- Do not use with injection equipment containing aluminum, as this can degrade platinum compounds.
- Unopened vials should be stored at 15-30°C; protect from light.

Leucovorin:

- Leucovorin may be diluted in 250mL D5W if given concurrently with oxaliplatin (over 2 hours) using Y-site administration.
- Leucovorin should not be mixed in the same infusion as 5-fluorouracil as a precipitate may form.
- Keep refrigerated; protect from light.

Fluorouracil bolus:

- Slow push through sidearm of free-flowing IV (5% Dextrose, Normal Saline)
- May be mixed in 50mL minibag (NS or D5W); infuse IV over 15 minutes.
- Store unopened vials at room temperature (15-25°C). Protect from light.

Fluorouracil IV continuous infusion:

- Refer to local guidelines on preparation of fluorouracil IV infusion.
- Continuous infusion via central line or PICC using CADD infusion pump, infusor bottle or similar device.
- Incompatible with doxorubicin, epirubicin, diazepam, methotrexate and cytarabine; line must be flushed between administrations of fluorouracil and these agents
- Store unopened vials at room temperature (15 to 25°C). Protect from light

Refer to **Section L - Other Notes** section for Information on the **Antidote for Fluorouracil Overdose**.

Also refer to the CCO guideline for detailed description of <u>Management of Cancer Medication-</u> Related Infusion Reactions.

Contraindications:

- patients with poor nutritional state
- patients with depressed bone marrow function (prior pelvic irradiation / marrow infiltration)
- patients with potentially serious infections
- patients with untreated CNS metastases
- patients with known hypersensitivity to the drugs, other platinum agents (e.g. cisplatin,

carboplatin), or any of their excipients

- patients with known hypersensitivity to Chinese hamster ovary cell product or to other recombinant human or humanized antibodies
- patients with known complete absence of dihydropyrimidine dehydrogenase (DPD) activity, with fluorouracil. Refer to the DPD Deficiency Guidance for Clinicians for more information.
- severe renal impairment (CrCl < 30 mL/min), with oxaliplatin
- fluorouracil should not be used within 4 weeks of treatment with brivudine, sorivudine or their chemically related analogues.

Warnings/Precautions:

- · Avoid the use of live vaccines.
- Oxaliplatin may result in dizziness or visual disturbances (including transient vision loss) in some patients; patients should exercise caution in driving or operating machinery.
- Use fluorouracil with extreme caution in patients who:
 - have undergone recent major surgery,
 - have renal or hepatic impairment,
 - have widespread bone marrow involvement,
 - have previous use of other myelosuppressive chemotherapeutic agents,
 - have a history of high dose irradiation to bone marrow-bearing areas,
 - have a history of heart disease,
 - or are suspected to have DPD deficiency. Refer to the <u>DPD Deficiency Guidance for Clinicians</u> for more information.
- Bevacizumab should not be initiated for at least 28 days following major surgery or until wound healing has occurred; hold for 28 days prior to major elective surgery
- The safety and efficacy of concurrent radiotherapy and bevacizumab has not been established
- Use bevacizumab with caution in:
 - Elderly patients
 - Patients with a history of arterial thromboembolism or significant cardiovascular disease or cardiac failure
 - Patients with coagulopathies (congenital, acquired or therapeutic)

- Patients with recurrent hemoptysis (>2.5ml), serious hemorrhage, or with squamous NSCLC
- Patients with colorectal cancer and colorectal stents increased risk of GI perforation has been reported
- Patients given concurrent bisphosphonates or other anti-angiogenic agents, given increased risk of ONJ

Pregnancy / Lactation

- This regimen is **contraindicated** for use in pregnancy. Adequate contraception should be used by patients and their partners while on treatment and after the last treatment dose. Recommended methods and duration of contraception may differ depending on the treatment. Refer to the drug monograph(s) for more information.
- Breastfeeding is contraindicated during this treatment and after the last treatment dose.
 Refer to the drug monograph(s) for recommendations after the last treatment dose (if available).
- Fertility effects: Yes

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I - Recommended Clinical Monitoring

Treating physicians may decide to monitor more or less frequently for individual patients but should always consider recommendations from the product monograph.

Refer to the <u>hepatitis B virus screening and management</u> guideline for monitoring during and after treatment.

Recommended Clinical Monitoring

- CBC; baseline and before each cycle
- Electrolytes, including magnesium; baseline and before each cycle
- Liver function tests; baseline and before each cycle
- Renal function tests; baseline and before each cycle
- INR, if patient on anticoagulants; baseline and as clinically indicated
- Blood pressure; baseline and every 2-3 weeks during therapy and more frequently in patients who develop hypertension
- Dental evaluation; baseline
- Urine dipstick, 24 hour urine collection is recommended for patients with a 2+ or greater urine dipstick; baseline and at each visit

- Clinical assessment of GI effects (including stomatitis, diarrhea, perforation, fistula), neurotoxicity, infection, bleeding, skin effects, thromboembolism, hypersensitivity, local reactions, ONJ, delayed wound healing, respiratory, cardiovascular, or ophthalmic effects; at each visit
- Grade toxicity using the current <u>NCI-CTCAE</u> (Common Terminology Criteria for <u>Adverse Events</u>) version

Suggested Clinical Monitoring

- Cardiac function tests (Echo, RNA and/or MUGA scans) especially in patients who are close to the lifetime cumulative dose of anthracyclines/anthracenediones; Baseline and as clinically indicated
- Blood glucose, especially in patients with diabetes; Baseline and regularly

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J - Administrative Information

Approximate Patient Visit

3.5 to 4 hours

Pharmacy Workload (average time per visit)

Advantage time per visit)

44.894 minutes

74.167 minutes

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K - References

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Van Cutsem E, Rivera F, Berry S, et al. Safety and efficacy of first-line bevacizumab with FOLFOX, XELOX, FOLFIRI and fluoropyrimidines in metastatic colorectal cancer: the BEAT study. Ann Oncol 2009; 20: 1842–7.

PEBC Advice Documents or Guidelines

- <u>Strategies of Sequential Therapies in Unresectable, Metastatic Colorectal Cancer Treated</u> with Palliative Intent
- Continuous versus Intermittent Chemotherapy Strategies in Inoperable, Advanced Colorectal Cancer
- The Role of Primary Tumour Location in the Selection of Biologics for the Treatment of Unresectable Metastatic Colorectal Cancer

November 2023 Modified Pregnancy/lactation section

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L - Other Notes

Antidote for Fluorouracil Overdose:

Uridine triacetate is a prodrug of uridine and is a specific antidote for treating fluorouracil overdose or severe early onset toxicities. If available, consider administering as soon as possible (i.e. within 96 hours) for suspected overdose. If not available, treatment is symptomatic and supportive.

For usage approval and supply, contact Health Canada's <u>Special Access Program</u> (SAP) (Phone: 613-941-2108. On-call service is available for emergencies). Uridine triacetate (Vistogard®) is supplied by its manufacturer in the United States (Wellstat Therapeutics).

The recommended dosing and administration for **uridine triacetate** in patients ≥18 years is:

- 10 grams (1 packet of coated granules) orally every 6 hours for 20 doses in total, without regards to meals.
- Granules should not be chewed. They should be mixed with 3 to 4 ounces of soft foods such as applesauce, pudding or yogurt.

- The dose should be ingested within 30 minutes of preparation, followed by at least 4 ounces of water.
- Refer to the prescribing information on dose preparation for NG-tube or G-tube use.

Additional resources on the management of fluorouracil infusion overdose:

- Management of Fluorouracil Infusion Overdose Guideline (Alberta Health Services)
- Management of Fluorouracil Infusion Overdose at the BCCA Interim Guidance (BC Cancer Agency)

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M - Disclaimer

Regimen Abstracts

A Regimen Abstract is an abbreviated version of a Regimen Monograph and contains only top level information on usage, dosing, schedule, cycle length and special notes (if available). It is intended for healthcare providers and is to be used for informational purposes only. It is not intended to constitute or be a substitute for medical advice, and all uses of the Regimen Abstract are subject to clinical judgment. Such information is provided on an "as-is" basis, without any representation, warranty, or condition, whether express, or implied, statutory or otherwise, as to the information's quality, accuracy, currency, completeness, or reliability, and Cancer Care Ontario disclaims all liability for the use of this information, and for any claims, actions, demands or suits that arise from such use.

Information in regimen abstracts is accurate to the extent of the ST-QBP regimen master listings, and has not undergone the full review process of a regimen monograph. Full regimen monographs will be published for each ST-QBP regimen as they are developed.

Regimen Monographs

Refer to the <u>New Drug Funding Program</u> or <u>Ontario Public Drug Programs</u> websites for the most up-to-date public funding information.

The information set out in the drug monographs, regimen monographs, appendices and symptom management information (for health professionals) contained in the Drug Formulary (the "Formulary") is intended for healthcare providers and is to be used for informational purposes only. The information is not intended to cover all possible uses, directions, precautions, drug interactions or adverse effects of a particular drug, nor should it be construed to indicate that use of a particular drug is safe, appropriate or effective for a given condition. The information in the Formulary is not intended to constitute or be a substitute for medical advice and should not be relied upon in any such regard. All uses of the Formulary are subject to clinical judgment and actual prescribing patterns may not follow the information provided in the Formulary.

The format and content of the drug monographs, regimen monographs, appendices and symptom management information contained in the Formulary will change as they are reviewed and revised on a periodic basis. The date of last revision will be visible on each page of the monograph and regimen. Since standards of usage are constantly evolving, it is advised that the Formulary not be used as the sole source of information. It is strongly recommended that original references or product monograph be consulted prior to using a chemotherapy regimen for the first time.

Some Formulary documents, such as the medication information sheets, regimen information sheets and symptom management information (for patients), are intended for patients. Patients should always consult with their healthcare provider if they have questions regarding any information set out in the Formulary documents.

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