

HCP Training: KYMRIA[®] 2 x 10⁶ – 6 x 10⁸ cells dispersion for IV infusion (tisagenlecleucel)

Kymriah healthcare professional training material

KYMRIAH product and therapeutic indications

Kymriah is an immunocellular therapy containing tisagenlecleucel, autologous T-cells genetically modified ex vivo using a lentiviral vector encoding an anti-CD19 chimeric antigen receptor (CAR)

Kymriah is indicated for the treatment of:

- **Paediatric and young adult patients 2 to and including 25 years of age with B-cell acute lymphoblastic leukaemia (ALL) that is refractory, in relapse post-transplant or in second or later relapse**
- **Adult patients with relapsed or refractory diffuse large B-cell lymphoma (DLBCL) after two or more lines of systemic therapy**
- **Adult patients with relapsed or refractory follicular lymphoma (FL) after two or more lines of systemic therapy**

Materials provided to healthcare professionals and patients

The following materials are provided in the Healthcare Professional information pack:

- Singapore Package Insert
- Pharmacy/Cell Lab/Infusion Centre Training Material
- Healthcare Professional Training Material

The following materials are provided in the Patient information pack:

- Patient Alert Card
 - The patient should carry the Patient Alert Card at all times and show it to any healthcare provider
- Patient Educational Leaflet
 - Includes instructions for the patient or guardian/ caregiver and information for their healthcare professional

Kymriah Risk Management Plan (RMP): Key messages of additional risk minimisation measures

Controlled Distribution Program Objectives:

- To mitigate the safety risks associated with Kymriah treatment by ensuring that hospitals and their associated centres that dispense Kymriah infusion are specially qualified by Novartis
- **Kymriah will only be supplied to hospitals and associated centres that are qualified and only if the healthcare professionals involved in the treatment of a patient have completed the educational program, and have on-site, immediate access to tocilizumab; in the exceptional case where tocilizumab is not available due to a shortage, the treatment centre must have access to suitable alternative measures instead of tocilizumab to treat cytokine release syndrome (CRS)**

Kymriah Risk Management Plan (RMP): Key messages of additional risk minimisation measures (continued)

Educational Program Objectives:

- **Pharmacy/Cell Lab/Infusion Centre Training Material:**
 - Inform about reception, storage, handling, thawing and preparation for infusion of Kymriah to mitigate a decrease in cell viability of Kymriah due to inappropriate handling of the product and subsequent potential impact on the efficacy/safety profile
- **Healthcare Professional Training Material:**
 - **Mitigate the risk of severe or life-threatening CRS and neurological events** by ensuring those, who prescribe, dispense, or administer Kymriah, are aware of how to manage the risks of CRS and neurological events
 - **Encourage reporting of adverse events (AEs) suspected to be associated with the use of Kymriah** to Novartis or the local Health Authority
 - Counsel patients/guardians regarding:
 - Instances where Kymriah cannot be successfully manufactured and infusion cannot be provided, or the final manufactured product is Out-of-Specification (OOS)
 - The potential need for bridging chemotherapy and risk of progressive disease during manufacturing time, in addition to the risks of CRS and neurological events and actions to be taken

CRS, cytokine release syndrome.

Kymriah Risk Management Plan (RMP): Key messages of additional risk minimisation measures (continued)

Educational Program Objectives (continued):

- **Patient Educational Leaflet**

- Create awareness that there are instances where Kymriah cannot be successfully manufactured and infused, or final product is Out-of-Specification (OOS)
- Inform about the potential need for bridging chemotherapy, associated adverse drug reactions, and the risk of progressive disease during the Kymriah manufacturing time
- Educate patients/guardians on the risks of CRS and neurotoxicity, and when to seek medical attention
- Inform about monitoring requirements and potential for hospitalisation following Kymriah infusion

CRS, cytokine release syndrome

Reasons to delay Kymriah treatment

Delay KYMRIA[®] infusion if the patient has:

Unresolved serious adverse reactions (especially pulmonary reactions, cardiac reactions or hypotension) from preceding chemotherapies

Active uncontrolled infection

Active graft-versus-host disease (GVHD)

Significant clinical worsening of leukaemia burden or rapid progression of lymphoma following lymphodepleting chemotherapy

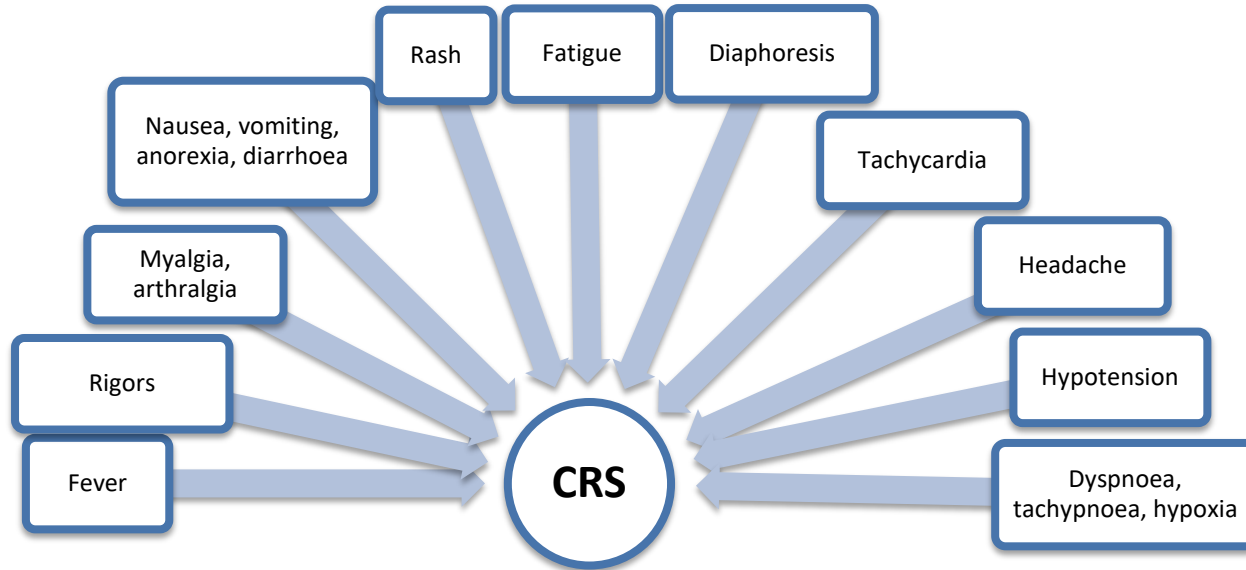
KYMRIAH-associated cytokine release syndrome (CRS)

Cytokine release syndrome (CRS)

- CRS is a systemic inflammatory response associated with Kymriah cell expansion, activation and tumour cell killing
- CRS, including fatal or life-threatening events, has been frequently observed after Kymriah infusion
 - In paediatric and young adult patients with r/r B-cell ALL (ELIANA study, n=79): **77%** of patients developed CRS of any grade (Penn grading system) and **48% developed grade 3 or 4 CRS**
 - In adult patients with r/r DLBCL (JULIET study, n=115): **57%** of patients developed CRS of any grade (Penn grading system) and **23% developed grade 3 or 4 CRS**
 - In adult patients with r/r FL (ELARA study, n=97): 50% of patients developed CRS of any grade (Lee grading criteria) and none developed grade 3 or 4 CRS
- In almost all cases, development of CRS after Kymriah infusion occurred between **1 to 10 days** (median onset 3 days) in B-cell ALL patients, between 1 and 9 days (median onset 3 days) in adult DLBCL patients, and between 1 to 14 days (median onset 4 days) in adult FL patients
- The median time to resolution of CRS was 8 days in B-cell ALL patients, 7 days in DLBCL patients, and 4 days in FL patients
- Patients with CRS may require admission to the intensive care unit for supportive care

ALL, acute lymphoblastic leukaemia; DLBCL, diffuse large B-cell lymphoma; FL, follicular lymphoma; r/r, relapsed/refractory.

CRS signs and symptoms: patient presentation



Diagnosis based on clinical signs and symptoms¹⁻³

CRS, cytokine release syndrome.

References: 1. Lee DW et al. *Biol Blood Marrow Transplant*. 2019;25(4):625-638. 2. Smith LT, Venella K. *Clin J Oncol Nurs*. 2017;21(2):29-34. 3. Kymriah Singapore Package Insert. Nuremberg, Germany: Novartis Pharma GmbH; 2022

CRS-induced organ toxicity and associated adverse reactions

Hepatic	<ul style="list-style-type: none">• Hepatic failure: elevated aspartate aminotransferase (AST), alanine aminotransferase (ALT), and hyperbilirubinaemia
Renal	<ul style="list-style-type: none">• Acute kidney injury and renal failure, may require dialysis
Respiratory	<ul style="list-style-type: none">• Respiratory failure, pulmonary oedema, may require intubation and mechanical ventilation
Cardiac	<ul style="list-style-type: none">• Tachycardia• Atrial fibrillation• Ventricular extrasystoles• Cardiac failure
Vascular	<ul style="list-style-type: none">• Hypotension• Capillary leak syndrome
Hematopoietic disorders including cytopenias >28 days following Kymriah infusion	<ul style="list-style-type: none">• Leukopenia, neutropenia, thrombocytopenia, and/or anaemia• Note: Myeloid growth factors, particularly granulocyte macrophage-colony stimulating factor (GM-CSF), have the potential to worsen CRS symptoms and are not recommended during the first 3 weeks after Kymriah infusion or until CRS has resolved

CRS-induced organ toxicity and associated adverse reactions (continued)

Coagulopathy with hypofibrinogenemia	<ul style="list-style-type: none">• Disseminated intravascular coagulation (DIC) with low fibrinogen levels• May result in haemorrhage
Hemophagocytic lymphohistiocytosis / macrophage activation syndrome (HLH/MAS)	<ul style="list-style-type: none">• Note: Severe CRS and HLH/MAS may have overlapping pathologies, clinical manifestations, and laboratory profiles• Note: When HLH or MAS occurs as a result of Kymriah, treat per CRS management algorithm. For late-onset, tocilizumab-refractory HLH/MAS, consider other anti-cytokine and anti-T cell therapies following institutional policy and published guidelines

CRS, cytokine release syndrome.

Risk factors for severe CRS that could be established in ALL, DLBCL and FL

Patients 2 to and including 25 years of age with r/r B-cell ALL	
Pre-infusion tumor burden	<ul style="list-style-type: none"> High pre-infusion tumor burden, uncontrolled or accelerating tumor burden following lymphodepleting chemotherapy can be associated with severe CRS Prior to administration of Kymriah, efforts should be made to lower and control the patient's tumor burden
Infection	<ul style="list-style-type: none"> Active infection may increase the risk of severe CRS Infections may also occur during CRS and may increase the risk of fatal events Prior to administration of Kymriah, provide appropriate prophylactic and therapeutic treatment for infections, and ensure complete resolution of any existing infection
Onset of fever	<ul style="list-style-type: none"> Early onset of fever can be associated with severe CRS
Onset of CRS	<ul style="list-style-type: none"> Early onset of CRS can be associated with severe CRS
Adult patients with r/r DLBCL	
Pre-infusion tumor burden	<ul style="list-style-type: none"> High tumor burden can be associated with severe CRS
Adult patients with r/r FL	
No risk factors for severe CRS were established in adult patients with r/r FL as no patients developed severe CRS in the ELARA clinical study.	

ALL, acute lymphoblastic leukaemia; CRS, cytokine release syndrome;
DLBCL, diffuse large B-cell lymphoma; FL, follicular lymphoma; r/r, relapsed/refractory.

Monitoring of CRS

- Patients should be monitored daily for **the first 10 days** following infusion for signs and symptoms of potential CRS, neurological events and other toxicities
- Physicians should consider hospitalisation for the first 10 days post-infusion or at the first signs/symptoms of CRS and/or neurological events
- After the first 10 days following the infusion, the patient should be monitored at the physician's discretion
- Patients should be instructed to remain within proximity (i.e., **within 2 hours' travel**) of a qualified clinical facility for at least 4 weeks following infusion

CRS, cytokine release syndrome.

Management of CRS

- CRS should be managed based upon clinical presentation and according to the Kymriah CRS management algorithm as described in the Singapore Package Insert and in the following slides
- In all indications, appropriate **prophylactic and therapeutic treatment for infections** should be provided, and complete resolution of any existing infections should be ensured
- Infections may also occur during CRS and may increase the risk of a fatal event
- Patients with medically significant cardiac dysfunction should be managed by standards of critical care and measures such as echocardiography should be considered

CRS, cytokine release syndrome

Management of CRS (continued)

- Anti-IL-6 based therapy such as tocilizumab* has been administered for moderate or severe CRS associated with Kymriah and a minimum of 2 doses of tocilizumab per patient must be on site and available for administration prior to Kymriah infusion. Treatment centre should have timely access to additional doses of tocilizumab within 8 hours to manage CRS according to the CRS management algorithm per local prescribing information
- In the exceptional case where tocilizumab is not available due to a shortage, the treatment centre must have access to suitable alternative measures instead of tocilizumab to treat CRS
- Due to the known lympholytic effect of corticosteroids*:
 - Do not use **corticosteroids** for premedication except in the case of a life-threatening emergency
 - Avoid the use of **corticosteroids** after infusion except in cases of life-threatening emergencies or in line with the CRS management algorithm
- Tumour necrosis factor (TNF) antagonists are not recommended for the management of Kymriah-associated CRS

CRS, cytokine release syndrome; IL, interleukin.

*Kymriah continues to expand and persist despite administration of tocilizumab and corticosteroids.

KYMRIAH CRS management algorithm

CRS Severity	Symptomatic Treatment	Tocilizumab	Corticosteroids
Mild symptoms requiring symptomatic treatment only e.g. <ul style="list-style-type: none">• low fever• fatigue• anorexia	Exclude other causes (e.g. infection) and treat specific symptoms with, for example, antipyretics, antiemetics, analgesics, etc. If neutropenic, administer antibiotics per local guidelines.	Not applicable	Not applicable

CRS, cytokine release syndrome.

KYMRIAH CRS management algorithm (continued)

CRS Severity	Symptomatic Treatment	Tocilizumab	Corticosteroids
Symptoms requiring moderate intervention: <ul style="list-style-type: none"> ▪ high fever ▪ hypoxia ▪ mild hypotension 	Antipyretics, oxygen, intravenous fluids and/or low-dose vasopressors as needed	If no improvement after symptomatic treatment administer tocilizumab intravenously over 1 hour: <ul style="list-style-type: none"> ▪ 8 mg/kg (max. 800 mg) if body weight ≥ 30 kg ▪ 12 mg/kg if body weight < 30 kg If no improvement, repeat every 8 hours (max total of 4 doses)*	If no improvement within 12-18 hours of tocilizumab, administer a daily dose of 2 mg/kg intravenous methylprednisolone (or equivalent) until vasopressor and oxygen no longer needed, then taper*
Symptoms requiring aggressive intervention: <ul style="list-style-type: none"> ▪ hypoxia requiring high-flow oxygen supplementation or ▪ hypotension requiring high-dose or multiple vasopressors 	High-flow oxygen Intravenous fluids and high-dose vasopressor(s) Treat other organ toxicities as per local guidelines		
Life-threatening symptoms: <ul style="list-style-type: none"> ▪ haemodynamic instability despite intravenous fluids and vasopressors ▪ worsening respiratory distress ▪ rapid clinical deterioration 	Mechanical ventilation Intravenous fluids and high-dose vasopressor(s) Treat other organ toxicities as per local guidelines		

* If no improvement after tocilizumab and steroids, consider other anti-cytokine and anti-T cell therapies following institutional policy and published guidelines.

Alternative CRS management strategies may be implemented based on appropriate institutional or academic guidelines.

CRS, cytokine release syndrome.

Definition of high-dose vasopressors¹⁻³

Vasopressor	Dose to be given for ≥ 3 hours	
	Weight-based dosing ^a	Flat dosing ^b
Norepinephrine monotherapy	≥ 0.2 mcg/kg/min	≥ 20 mcg/min
Dopamine monotherapy	≥ 10 mcg/kg/min	≥ 1000 mcg/min
Phenylephrine monotherapy	≥ 2 mcg/kg/min	≥ 200 mcg/min
Epinephrine monotherapy	≥ 0.1 mcg/kg/min	≥ 10 mcg/min
If on vasopressin	Vasopressin + norepinephrine equivalent (NE) of ≥ 0.1 mcg/kg/min ^d	Vasopressin + norepinephrine equivalent (NE) ≥ 10 mcg/min ^c
If on combination vasopressors (not vasopressin)	NE of ≥ 0.2 mcg/kg/min ^d	NE of ≥ 20 mcg/min ^c

^a Weight-based dosing was extrapolated by dividing the flat dosing of a vasopressor by 100.

^b If institutional practice is to use flat dosing.

^c Vasopressin and Septic Shock Trial (VASST) norepinephrine equivalent equation: NE dose (flat dosing) = [norepinephrine (mcg/min)] + [dopamine (mcg/kg/min) ÷ 2] + [epinephrine (mcg/min)] + [phenylephrine (mcg/min) ÷ 10]³

^d Vasopressin and Septic Shock Trial (VASST) norepinephrine equivalent equation, adapted for weight-based dosing from Russell JA et al.: NE dose (weight-based dosing) = [norepinephrine (mcg/kg/min)] + [dopamine (mcg/kg/min) ÷ 2] + [epinephrine (mcg/kg/min)] + [phenylephrine (mcg/kg/min) ÷ 10]³

References: 1. Lee DW et al. *Blood*. 2014; 2014;124(2):188-195. Erratum in: *Blood*. 2015;126(8):1048. 2. Porter DL et al. *Sci Transl Med*. 2015;7(303):303ra139. <https://stm.sciencemag.org/content/suppl/2015/08/31/7.303.303ra139.DC1>. Accessed March 30, 2020. 3. Russell JA et al. *N Engl J Med*. 2008;358(9):877-887. https://www.nejm.org/doi/suppl/10.1056/NEJMoa067373/suppl_file/nejm_russell_877sa1.pdf. Accessed March 30, 2020.

KYMRIAH-associated neurological events

Neurological events

- Neurological events, in particular encephalopathy, confusional state or delirium, occur frequently with Kymriah and can be severe or life-threatening. Other manifestations include a depressed level of consciousness, seizures, aphasia and speech disorder
 - In paediatric and young adult patients with r/r B-cell ALL (ELIANA study, n=79): manifestations of encephalopathy and/or delirium of all grades occurred in **39%** of patients, and **grade 3 or 4 were seen in 13% of patients within 8 weeks after infusion**
 - In adult patients with r/r DLBCL (JULIET study, n=115): manifestations of encephalopathy and/or delirium of all grades occurred in **20%** of patients, and **grade 3 or 4 were seen in 11% of patients** within 8 weeks after Kymriah infusion
 - In adult patients with r/r FL (ELARA study, n=97): manifestations of encephalopathy and/or delirium of all grades occurred in 9% of patients, and grade 3 or 4 were seen in 1% of patients within 8 weeks after Kymriah infusion
 - Encephalopathy is a dominant feature of immune effector cell-associated neurotoxicity syndrome (ICANS), a new term coming into use during this study that was reported in 4% of patients at all grades and in 1% of patients at grade 3 or 4, all within 8 weeks of Kymriah infusion

ALL, acute lymphoblastic leukaemia; DLBCL, diffuse large B-cell lymphoma; FL, follicular lymphoma; r/r, relapsed/refractory.

Neurological events (continued)

- The majority of neurological events occurred within 8 weeks following Kymriah infusion and were transient
 - Median time to onset*: 8 days in B-cell ALL, 6 days in DLBCL, and 9 days in FL
 - Median time to resolution: 7 days for B-cell ALL, 13 days for DLBCL, and 2 days for FL
- Neurological events can be concurrent with CRS, following resolution of CRS, or in the absence of CRS

ALL, acute lymphoblastic leukaemia; CRS, cytokine release syndrome; DLBCL, diffuse large B-cell lymphoma; FL, follicular lymphoma.

*Median time to onset of the first neurological events occurring at any time following Kymriah infusion.

Monitoring for neurological events

- Patients should be monitored daily for **the first 10 days** following infusion for signs and symptoms of potential CRS, neurological events and other toxicities
- Physicians should consider hospitalisation for the first 10 days post-infusion or at the first signs/symptoms of CRS and/or neurological events
- After the first 10 days following the infusion, the patient should be monitored at the physician's discretion
- Patients/guardians should be instructed to remain within proximity (i.e., within 2 hours' travel) of a qualified clinical facility for at least 4 weeks following infusion

CRS, cytokine release syndrome.

Evaluation and management of neurological events

- Patients should be diagnostically worked-up for neurologic events and managed depending on the underlying pathophysiology and in accordance with local standard of care
- Evaluation and grading of neurological events may include a neurologic assessment and evaluation of neurologic domains such as level of consciousness, motor symptoms, seizures, and signs of elevated intracranial pressure/cerebral oedema¹
- Patients should be monitored for infections, with late occurrence in some cases. Patients with neurological events should be diagnostically worked up for opportunistic infections of the central nervous system (CNS) and should be managed depending on the underlying pathophysiology and in accordance with local standard of care
- If the neurological event is concurrent with CRS, please refer to the CRS management algorithm for treatment recommendations
- Consider anti-seizure medications (e.g. levetiracetam) for patients at high risk (prior history of seizure) or administer in the presence of seizure
- For encephalopathy, delirium or associated events: appropriate treatment and supportive care should be implemented as per local standard of care. In worsening events, consider a short course of steroids

CRS, cytokine release syndrome.

Reference: 1. Lee DW, et al. *Biol Blood Marrow Transplant.* 2019;25(4):625-638.

Physician to provide patient/guardian education

Patient/Guardian education

Physicians need to hand out 2 materials: the Kymriah Patient Educational Leaflet and the Kymriah Patient Alert Card. Please review these materials with patients in detail

Please review and explain the Patient Educational Leaflet with patients, guardians, and caregivers

Patients/guardians should read and keep Kymriah Patient Educational Leaflet to remind them of the signs and symptoms of CRS and neurological events, in addition to other clinically important side effects that require immediate medical attention

Patients/guardians should read the Kymriah Patient Alert Card in its entirety. Patients should carry the card with them at all times and show it to all healthcare providers

CRS, cytokine release syndrome

Patient/Guardian education (continued)

Counsel patients/guardians on the possibility that Kymriah may not be successfully manufactured and infusion cannot be provided if the final manufactured product is Out-of-Specification (OOS) and does not pass release tests. In some instances, a second manufacturing of Kymriah may be attempted. In case of OOS, the final product may be still provided as per physician's request, if supported by a positive benefit-risk assessment

Counsel patients/guardians on potential need for bridging therapy to stabilise the underlying disease while awaiting manufacturing and associated drug adverse reactions

Counsel patients/guardians on the risk of progressive disease during the Kymriah manufacturing time

Counsel patients/guardians that before getting Kymriah, a short course of lymphodepleting chemotherapy for conditioning may be given

Advise patients/guardians of the risk of CRS and neurological events and to contact their healthcare provider if experiencing signs and symptoms associated with CRS and neurological events

CRS, cytokine release syndrome.

Patient/Guardian education (continued)

Patients/guardians should plan to stay within the proximity (i.e., within 2 hours' travel) of the qualified treatment centre for at least 4 weeks after receiving Kymriah treatment, unless otherwise indicated by the doctor

Instruct patients/guardians to return to the hospital daily for the first 10 days to allow monitoring for CRS, neurological events and other toxicities and inform them about the potential need for hospitalisation for the first 10 days post-infusion or at the first signs/ symptoms of CRS and/ or neurological events

Patients/guardians should be advised to measure the patient's temperature twice a day for 3-4 weeks after administration of Kymriah. If their temperature is elevated, they should see their doctor immediately

Due to the potential of Kymriah to cause problems such as altered or decreased consciousness, confusion, and seizures in the 8 weeks following infusion, patients should not drive, use machines, or take part in activities that require alertness

Patients/guardians should be advised that the patient should not donate blood, organs, tissues or cells

CRS, cytokine release syndrome.

KYMRIAH: Registry and adverse event reporting

Registry and adverse event reporting

- Adverse reactions associated with Kymriah can be reported to Novartis at <https://www.novartis.com/report> or by calling Novartis at **6722 6409**, or to your local Health Authority at Vigilance and Compliance Branch, Health Products Regulation Group, Health Sciences Authority at Tel: 6866 1111, or report online at <https://www.hsa.gov.sg/adverse-events>
- Importantly, when reporting adverse events, healthcare providers should always include the individual **Kymriah Batch ID**

Manufacturing failure and Out-of-Specification product

Overview of the Out-of-Specification product release process

- In some cases, it may either not be possible to manufacture Kymriah or the release criteria may not be met due to patient-intrinsic factors or manufacturing failure
- In instances where the product cannot be manufactured or if the manufactured product is Out-of-Specification (OOS), the treating healthcare professional will be informed as early as possible by so the appropriate measures for the safety of the patient can be taken
- In the case a Kymriah batch proves to be OOS, Novartis will conduct an assessment of the anticipated efficacy and safety risks pertaining to this particular quality defect. The risk assessment will take into consideration prior clinical experience with Kymriah infusion in clinical trials and commercial setting as available and published literature. Importantly, the assessment does not provide infusion recommendations but is meant to inform the treating physician of the anticipated risks associated with a potential infusion of such a batch.
- The Novartis risk assessment will be communicated to the treating physician to allow the physician to perform an independent evaluation of risk-benefit of this batch and either request the product to be provided for infusion or consider any alternatives, such as other anti-cancer treatment or re-manufacturing of a new batch (if feasible taking into account the medical status of the patient)



Thank you

SG2301065344

This document has been approved by HSA as of 04-01-2023

Page 34 of 34

For Healthcare Professionals only



Please visit <https://www.novartis.com.sg/product-list/kymriah> to access or download Package Insert. Alternatively, please scan this code for more information about this medicine

 **NOVARTIS** | Reimagining Medicine