The Alert Test

Designing and testing a genetic medicine tool

GEN.2B.5 "Enrichment: Use an engineering design process to research the current status of genetic technology and personalized medicine, then propose and test targeted medical or forensic applications.*"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline what genetic testing can and cannot tell clinicians now, circle the team's design criteria, and number the first test and the proposed retest 1 and 2.

A Flag, Not a Prescription

1. After a heart stent, a patient may receive clopidogrel, a medicine that helps prevent blood clots. The liver enzyme CYP2C19 helps activate it. Some inherited CYP2C19 variants reduce enzyme activity, so clopidogrel may work less well for certain patients. Clinical laboratories can test these variants, and published prescribing guidelines describe when a clinician might consider another medicine. Yet a genetic result is not a complete treatment plan: bleeding risk, other medicines, and access to alternatives also matter. An engineering team at a hospital wants to build a tool that flags relevant results for a pharmacist, without choosing a drug for the patient.

2. The team first interviews pharmacists and reviews current clinical guidelines rather than assuming every variant has the same effect. They define the problem as missed or confusing alerts after a stent. Their proposed tool reads a reported CYP2C19 result and marks cases that guidelines identify for pharmacist review. A successful prototype must flag every case in a test set that needs review, keep unnecessary flags low, and never display a drug order. Because lab reports use different words for the same result, the team designs a mapping step that translates approved report terms into a standard category. A pharmacist checks the mapping before testing.

3. To test the prototype safely, the team creates 20 fictional reports and has a pharmacist label each one using the guidelines. Five should trigger review; the tool flags four of those five and also flags two of the other fifteen. The missed case uses an unfamiliar lab term for reduced CYP2C19 activity. The team decides to add that term to its reviewed mapping list, then repeat the same test and try new fictional reports from a second lab. No real patient receives an automatic recommendation. Before clinical use, the hospital would also need privacy checks, pharmacist oversight, and validation with reports from more than one lab.

2 ANSWER WITH EVIDENCE

Use the passage

1. Which two sources does the team consult before designing the tool? How does each source help with the design?

2. State two criteria the team sets for a successful prototype. Why is the rule against displaying a drug order important?

3. Does the first test meet the team's criterion for flagging cases that need review? Use the test results to support your answer.

4. What change does the team propose for the missed case, and how will it test whether the change works beyond the first set of reports?

3 YOUR TURN

Your own words

Design a different tool that uses CYP2C19 results, not the pharmacist alert in the passage. In 5 to 7 sentences, describe its purpose, one current capability and one limit from the passage, a success criterion, a safe test, and a change you would make if the test fails.

ANSWER KEY

The Alert Test

HIGH SCHOOL · GEN.2B.5

PART 1 · READ AND MARK

Underline what genetic testing can and cannot tell clinicians now, circle the team's design criteria, and number the first test and the proposed retest 1 and 2. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Which two sources does the team consult before designing the tool? How does each source help with the design?	**Pharmacist interviews help the team understand alert problems in practice. Current clinical guidelines help it identify which results call for review.**
2	State two criteria the team sets for a successful prototype. Why is the rule against displaying a drug order important?	**The tool must flag every test case needing review and keep unnecessary flags low. It must not display a drug order because a genetic result alone is not a complete treatment plan.**
3	Does the first test meet the team's criterion for flagging cases that need review? Use the test results to support your answer.	**No. It flags four of the five cases needing review, but the criterion is to flag all five.**
4	What change does the team propose for the missed case, and how will it test whether the change works beyond the first set of reports?	**The team will add the unfamiliar lab term to its reviewed mapping list. It will repeat the first test and test new fictional reports from a second lab.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would design a patient portal card that helps people prepare questions about a CYP2C19 result after a stent. Labs can test these variants, but the result alone cannot determine which medicine is safest. The card would explain the result in plain language and ask patients to discuss it with their clinician. In a test, at least nine of ten volunteer readers should correctly identify that the card does not prescribe a drug. I would test a draft with fictional results and collect anonymous answers to a short question. If fewer than nine readers understand that limit, I would simplify the wording and test a revised card with new volunteers.

Accept other tools that use CYP2C19 results without making an automatic treatment decision. The response should include a passage-supported capability and limit, a checkable criterion, a safe test, and a revision linked to a possible failure.