

# An integrated CASUS® based curriculum for Human Genetics in the Duesseldorf Medicine Model Course of Study

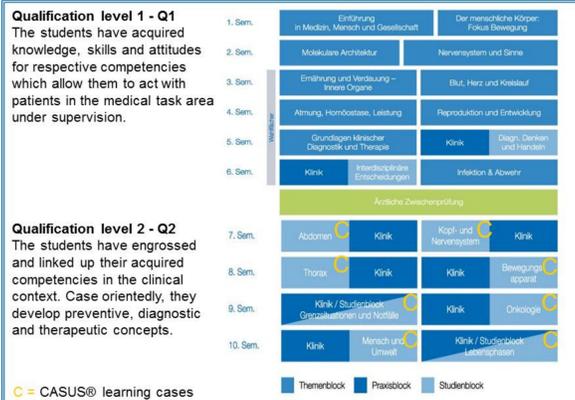
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## Introduction

Teaching human genetics in clinical medicine has become a challenging task due to the extraordinary rapid progress in the diagnostic possibilities. In addition, an increasing spectrum of genetic issues has to be addressed in all medical disciplines, and the students need to be prepared to utilize genetic tests according to the respective legal and economic preconditions.

To cope with this task we developed a longitudinal case based, learner oriented online course of human genetics. In this course, the students take over the perspective of the physician in the treatment of patients. This educational strategy teaches problem-solving abilities and differential diagnostic reasoning, thus preparing the students for the management of actual clinical situations with real patients. To address the interdisciplinary character of human genetics, the course is thematically integrated in the respective modules of the Duesseldorf curriculum.

## Structure of the Duesseldorf curriculum



Thematic allocation of CASUS®- learning cases in respective modules of the Q2 section of the Duesseldorf curriculum

Semester	Module	CASUS® Cases
7	Abdomen	HFE-assoc. hereditary hemochromatosis
	Head and Nervous System	Huntington's disease
8	Thorax	Hereditary thrombophilia
	Musculoskeletal System	Achondroplasia Duchenne muscular dystrophy
9	Borderline Situations and Emergencies	Marfan syndrome
	Oncology	Hereditary breast and ovarian cancer Hereditary non-polyposis colon cancer Multiple Endocrine Neoplasias Type 2
10	Phases of Life	Fragile X syndrome Klinefelter syndrome Ullrich-Turner syndrome Down syndrome
	Man and Environment	Valproic acid embryopathy

## Materials & Methods

Learning objectives in human genetics were defined according to the mission statement of education of the Medical Faculty of the Heinrich-Heine-University. The CASUS®-platform was used for the development of the learning cases. Cases with genetic diseases were selected from the records of the Institute of Human Genetics of the University Clinics Duesseldorf according to one of the following criteria:

- High clinical relevance
- Modell disease for genetic disease mechanisms

All patients had to give written consent for the use of their clinical data and of images of their face in the CASUS®-cases. Access to the CASUS®-cases was restricted to the students who were registered in the respective module. To practice the communication of genetic issues the students took over roles of patients and physicians in a genetic counselling setting role play. The overall satisfaction of the students with the new learning format was assessed by an online evaluation rating from 1 (=very satisfied) to 6 (=not at all satisfied).

## Learning objectives covered by CASUS®-cases

The students....

- describe and evaluate clinical findings in patients and their families
- integrate information of interdisciplinary medical investigations in the clinical decision making
- develop a differential diagnostic procedure
- discuss the usefulness of genetic test/s in this procedure
- evaluate the significance of anticipated genetic test results for the patients and their relatives
- consider the legal and economic frame conditions of genetic tests
- consider the preanalytical prerequisites
- understand and interpret genetic test results in view of the clinical presentation
- explain the biological and medical consequences of a genetic finding
- develop recommendations for further support and treatment of the patients and their relatives

## Learning cards structure

- Reason for referral
- Anamnese
- Family history
- Clinical, clinical laboratory, and/or imaging findings
- Genetic Differential diagnosis
  - Diseases
  - Respective tests
  - Anticipated consequences of test results
- Testing algorithms
- Informed consent
- Order and costs of tests
- Interpretation of molecular and/or cytogenetic findings
- Biological background of disease causing mutations
- Recommendations for further measures for patient/family treatment

## Results

A total of 14 CASUS®-cases have been developed covering the learning objectives in all modules of the Q2 section of the Duesseldorf curriculum.

In the modules „Oncology“ and „Phases of Life“ three or four cases, respectively, were used to practice the communication of genetic issues in a role play using an interdisciplinary genetic counselling setting.

The CASUS®-cases included media such as images, videos and animations. Links to internal and external resources, e.g., GeneReviews®, were provided for further learning material. The contents of the online cases were topics of the multiple choice test at the end of each module.

The preliminary results of the online evaluation of the CASUS®-cases showed a good overall satisfaction of the students with this learning format over a period of six turns in the module „Musculoskeletal System“ (1.7-3.1, mean 2.5).

## Screenshot of the card „Huntington´s disease - Clinical findings“ Unvoluntary movements – video presentation

## Screenshot of the card „Huntington´s disease - Clinical findings“ Unvoluntary movements – multiple select question

## Summary & Conclusions

### CASUS®-cases

- are a valuable tool to cope with increasing demands for teaching human genetics in a medical curriculum of studies,
- allow to display a routine workflow of the treatment of patients with genetic issues,
- provide the platform for an interdisciplinary approach to human genetic learning contents.

Preliminary results of the evaluation of this online-learning format showed a good overall satisfaction of the students

CASUS®-cases may be also valuable for practicing the communication of genetic issues in blended learning settings.

Additional learning cases will be developed to increase the learning contents in human genetics which will be mediated by online CASUS®-cases.

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## Screenshot of the card „Huntington´s disease – Clinical findings“ Unvoluntary movements – Feedback and explanation

## Screenshot of the card „Huntington´s disease – Repeat expansion“ – Genetic mechanisms