

# Workforce Scheduling<sup>1</sup>

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## 1 The problem

The Emergency Department at the local hospital provides emergency health care on an as-needed basis for people involved in accidents, having injuries, etc. Understandably, it is difficult to predict how busy the Department will be at any one time and, accordingly, it is also difficult to plan and schedule its workforce requirements, particularly for nurses qualified and experienced in working in such a department. Recently the hospital has started using WorkForce Unlimited, a company that specializes in providing temporary nursing staff to the health care sector. WorkForce Unlimited offered to provide temporary nurses under three contract options that differ in terms of the length of employment and the cost. The three options are summarized:

Option	Length of Employment	Cost (€)
1	One month	2000
2	Two months	4800
3	Three months	7500

The longer contract periods are more expensive because WorkForce Unlimited experiences greater difficulty finding temporary nursing staff who are willing to commit to longer work assignments. Over the next six months, the hospital projects the following needs for additional nurses in the Emergency Department.

Month	January	February	March	April	May	June
Nurses Needed	10	23	19	26	20	14

Each month, the hospital can hire as many temporary nurses as needed under each of the three options. For instance, if the hospital hires five nurses in January under Option 2, WorkForce Unlimited will supply the hospital with five temporary nurses who will work two months: January and February. For these nurses, the hospital will have to pay  $5 \times (\text{€ } 4800) = \text{€ } 24\,000$ . Due to some negotiations under way, the hospital does not want to commit to any contractual obligations for temporary nurses that extend beyond June. The hospital's health and safety programme requires each temporary nurse to receive training at the time of hire. The training programme is required even if the person worked for the hospital in the past. The hospital estimates that the cost of training is € 875 each time a temporary nurse is hired. Thus, if a temporary nurse is hired for one month, the hospital will incur a training cost of € 875, but will incur no additional training cost if the employee is on a two- or three-month contract.

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## 2 Managerial Report

Develop a model that can be used to determine the number of temporary nurses the hospital should hire each month under each contract plan in order to meet the projected needs at a minimum total cost. Include the following items in your report:

1. A schedule that shows the number of temporary nurses that the hospital should hire each month for each contract option.
2. A summary table that shows the number of temporary nurses that the hospital should hire under each contract option, the associated contract cost for each option, and the associated training cost for each

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<sup>1</sup> Anderson, D.R., Sweeney D.J., Williams T.A., Wisniewski M., Pierron X. (2017); "An introduction to Management Science: Quantitative approaches to decision-making"; 3<sup>rd</sup> edition, CENGAGE Learning

option. Provide summary totals showing the total number of temporary nurses hired, total contract costs and total training costs.

3. If the cost to train each temporary nurse could be reduced to €700 per month, what effect would this change have on the hiring plan? Explain. Discuss the implications that this effect on the hiring plan has for identifying methods for reducing training costs. How much of a reduction in training costs would be required to change the hiring plan based on a training cost of €875 per temporary nurse?
4. Suppose that the hospital hired ten full-time nurses at the beginning of January in order to satisfy part of the requirements over the next six months. If the hospital can hire full-time nurses for € 16.50 per hour, including fringe benefits, what effect would it have on total labour and training costs over the six-month period as compared to hiring only temporary nurses? Assume that full-time and temporary nurses both work approximately 160 hours per month. Provide a recommendation regarding the decision to hire additional full-time nurses.